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Evaluating User Experience (UX) of students using a Learning Management System Moodle in a Finnish university through a holistic UX model approach

Master's thesis in Governance of Digitalization
Master's Programme
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ABSTRACT

ÅBO AKADEMI UNIVERSITY FACULTY OF SOCIAL SCIENCES, BUSINESS AND ECONOMICS

Subject: Master's thesis in Governance of Digitalisation	
Writer: Ilia Maslov (ilia.maslov@abo.fi)	
Title: Evaluating User Experience (UX) of students using a Learning Management System Moodle in a Finnish university through a holistic UX model approach	
Supervisor: Shahrokh Nikou	Supervisor: Gunilla Widén

Abstract:
Literature suggests that e-learning has growing importance for higher education. Learning Management System (LMS) is an integral part of the facilitation of the e-learning process. Hence, students' User Experience (UX) of LMS is essential in learning at higher education. However, existing research literature into UX of LMS mostly relies on quantitative surveys based on reductionist technology acceptance models. Contemporary research covers the research gap by employing a holistic UX model in a qualitative-driven mixed methods approach. Semi-structured interviewing of 20 students at Åbo Akademi University was conducted, where Moodle is used as an LMS. As a result, UX of Moodle may be characterized as an efficient study-related tool, which lacks entertainment and communication facilitation. Other web-platforms (such as e-mail, WhatsApp, or YouTube) were found to affect the UX of Moodle by replacing, compensating or complimenting some features of Moodle. Data suggests that the context of use and how teachers use Moodle are highly detrimental to the students' UX. Four groups of students were established, whose UX ranged from good to somewhat bad. Most of the students had UX that is between somewhat good and acceptable. Solutions were proposed to the identified issues in the UX based on the students' feedback. Additionally, the research attempts to find whether gender differences exist in the UX of Moodle. Data suggest that there are no significant differences. Still, there may be slim differences in certain aspects, with women focusing slightly more on a holistic use of Moodle, including how it is used by others and how it looks, whereas men were focusing slightly more on the ability of LMS to facilitate the performance of tasks, such as learning. Additionally, women were more variant in evaluating UX than men. Finally, an employed holistic UX model is evaluated for its applicability to explore UX of an LMS. It was found that the holistic UX model allows for exploring a UX, but quite broadly. As such, a new conceptual model of UX of an LMS was developed, which may potentially help to focus on analyzing specific elements of an LMS's UX. The results of the research are compared with findings from the literature. Ideas for further research are also suggested.

Keywords: E-learning, Learning Management System (LMS), mixed methods, semi-structured interviewing, User Experience (UX)

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Finally, I must express my very profound gratitude to my parents, and especially to my mother, who, by the merits of their entrepreneurial spirit, have allowed for an opportunity to attain higher education. This accomplishment would not have been possible without them. Thank you.

Maslov Ilia

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1 Introduction

New educational technologies are being more widely used. Web-Based Learning (WBL) teaching is based on a large variety of different teaching methods. Moodle, as an LMS, can be used to facilitate learning (Sheshasaayee & Bee, 2017, p. 738). E-learning as a teaching-learning mechanism offers tremendous opportunities for learning beyond boundaries: increased reach to thousands of learners, facilitation of the student's interaction with the teacher and the content, collaborative learning, as well as facilitation of the teaching process planning. Moodle-based e-learning programs enable teachers to use multiple teaching tools like question banks, assignments, feedback, which certainly enriches students learning experience. (Bansode & Kumbhar, 2012, p. 415).

Current research in the use and adoption of e-learning systems is found to be mainly based on various Technology Acceptance Models (TAMs) and usability testing, primarily via quantitative measurement methodology. Holistic User Experience (UX) model, developed as a series of EU-funded research by Pallot and contributing authors (Pallot et al., 2014), was characterized by the researcher to be prominent in explaining UX holistically, contrary to the reductionist approaches by TAMs. Applying the model in a qualitative-driven study may shed additional light on the topic of UX of an LMS and thus may be found as a potent tool in exploring the topic. To the best of the researcher's knowledge, the holistic UX model was not yet applied in the context of LMSs. Hence, the contemporary study shall address this research gap by analyzing UX of an LMS and evaluating the applicability of the holistic UX model for analyzing UX of an LMS.

According to Khan (2004), in the e-learning process, which is iterative, learners' feedback could be used at the evaluation stage for consequent improvement of the process by the design team. Cavus & Zabadi (2014, p. 525) state that all LMSs software development organizations work hard to improve their product, and Moodle may not be the best LMS tomorrow, and as such specific algorithms may be necessary for continual comparison of the LMSs. Krawczyk et al. (2017) state that the identification and evaluation of the UX features addressed during the design of the product or service is crucial for innovation. Nakamura et al. (2017a) state that according to the performed systematic literature review, none of the research in usability and UX of LMSs proposed solutions to the identified issues in usability and UX of studied LMS. Hence, the contemporary research shall address this gap by performing the study in a pragmatic stance, which shall include users' feedback on the UX of an LMS to propose potential solutions to identified issues in the UX and usability of an LMS.

Aufderhaar et al. (2019, p. 66) claim that gender difference has no significant impact on the typical UX factors of different website designs. However, Ong and Lai (2006, p. 826-827) claim that in the e-learning, there are differences in the interaction with the IS between genders. Besides, Alkhaldi and Al-Sa'di (2018, p. 13) state that men could interpret the technical savviness of the web banner – for example, evaluating the present visual and audio features. Thus, ibid. (2018, p. 13-14) state that gender should be included as a factor when assessing the UX of the web design. Finally, Simon (2000, p. 18) concludes that the perception and satisfaction of the website

may differ within cultural clusters and gender groups. The research does not offer a robust view on whether gender should or should not be considered as a factor affecting the UX of websites or e-learning. Hence, this is another research gap that shall be addressed by contemporary research.

1.1. Research Questions

According to the literature review, specific research gaps in the literature were outlined. Following Research Questions (RQs) were created to address the gaps:

RQ1*: What is the holistic UX of the students, who use Moodle of Åbo Akademi University?*

RQ2*: Are there any gender differences among the students in the holistic UX of Moodle?*

RQ3*: Is the holistic UX model by Topolewski et al. (2019) applicable for analyzing the holistic UX of an LMS?*

RQ1 is about analyzing deductively the UX of Moodle (LMS) in an exploratory manner through mixed methods approach. RQ1 is to be answered with a pragmatic research stance in mind (i.e., researching for the sake of improvement). RQ2 is based on the results of RQ1. RQ2 is about researching in an exploratory manner the potential for existence of gender differences in UX. RQ3 comes as an evaluation of the applicability of the utilized research approach proposed by the literature to evaluate UX when answering RQ1 and RQ2. Hence, RQ3 is following exploratory and explanatory research goals in a partially inductive manner.

1.2. Structure of the thesis

In the introductory chapter 1, the background and the motivation for the research are briefly discussed. In chapter 2, the literature review is presented – the operationalization of the required terminology and theoretical frameworks are given. Chapter 3 describes the methodology: research questions derived from the literature review, research design, data collection, and data analysis approaches. Chapter 4 provides the results of the research: respondents' demographics, quantitative and qualitative data analysis, verification of the results, and summary of the data analysis. Final chapter 5 provides discussions and conclusions of the thesis. This chapter discusses the resulting answers to the research questions, provides practical implications, and assesses the results concerning previous research. Limitations of the study are also discussed in chapter 5. Finally, recommendations for future research are provided based on the results.

2 Literature Review

In this part literature review is provided regarding three main parts that are in the focus of the research: e-learning, Learning Management System (LMS) – Moodle, User Experience (UX), and usability. Literature review on the gender differences in e-learning and LMSs is discussed in a separate part. In addition to the operationalization of the concepts relevant to the research, the literature review covers the theoretical framework, which shall be applied in the study.

2.1. E-Learning

Sun et al. (2008) defined e-learning as the use of telecommunication technology to deliver information for education and training, with e-learning emerging as the paradigm of modern education. McMullin et al. (2007) state that the younger generation could be more accepting of the use of technology for learning, as compared to older generations. Contrary, Fleming et al. (2017) state that age is not an essential factor for the satisfaction of and intention of using e-learning. Ibid. (2017) state that good predictors of future use and overall satisfaction from using e-learning are low perceived complexity of the e-learning system, authentic learning (i.e., the knowledge of e-learning is perceived to have useful applications), and technical support available for e-learning (i.e., ICT service that helps with technical issues of e-learning). Sun et al. (2008) state that personal perceptions about e-learning could influence attitudes and impact whether a user would intend to refer to e-learning in the future. Uppal et al. (2018) state that service quality (i.e., the supportiveness of the service overall, such as ICT helpdesk), information quality (i.e., learning content, which is of high informativeness, interactivity and well-delivered), and system quality (i.e., interface of the website, which is attractive and easy to use and navigate) are different aspects of e-learning quality. There are certain advantages and disadvantages (Table 1) to both the traditional classroom learning and e-learning, as stated by Zhang et al. (2004, p. 76).

Table 1. Advantages and disadvantages of traditional classroom learning and e-learning.

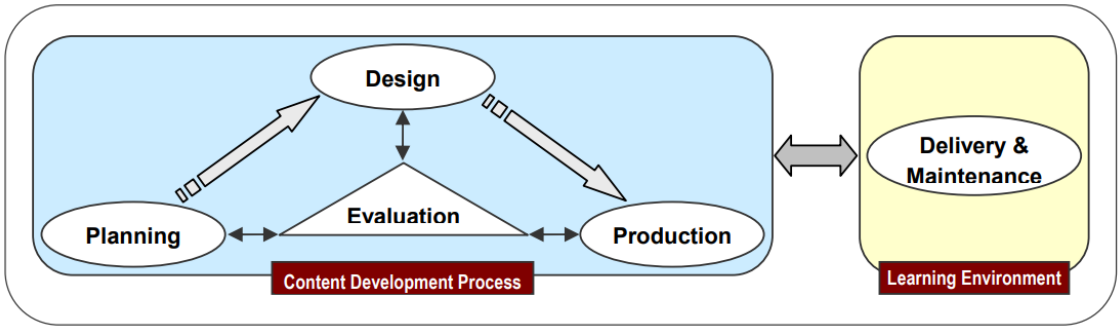
	Traditional Classroom Learning	**E-Learning**
Advantages	• Immediate feedback • Being familiar to both instructors and students • Motivating students • Cultivation of a social community	• Learner-centered and self-paced • Time and location flexibility • Cost-effective for learners • Potentially available to global audience • Archival capability for knowledge reuse and sharing
Disadvantages	• Instructor-centered • Time and location constraints • More expensive to deliver	• Lack of immediate feedback in asynchronous e-learning • Increased preparation time for the instructor • Not comfortable to some people • Potentially more frustration, anxiety and confusion

Source: Zhang et al. (2004, p. 76)

Khan (2004) has defined e-learning as an iterative process (Figure 1 below). Ibid. (2004) describes e-learning process stages in the following way:

- Planning Stage - the planning team (which can be comprised of individuals such as director, manager, instructional designer, etc.) should develop a project plan by analyzing various aspects of the people, processes, and products involved in the e-learning initiative.
- Design Stage - the research and design (R&D) coordinator lead the e-learning course design process, based on a comprehensive understanding of learners' needs, institutional capabilities, and experience.
- Production Stage – production team creates an online course from the course storyboard created during the design stage.
- Evaluation Stage – inherent and on-going evaluations are conducted to improve the effectiveness of e-learning materials. With learners' feedback, the evaluation specialist communicates with the design and production teams for revising the course accordingly.
- Delivery and Maintenance (D&M) Stage – D&M team maintains the learning management system (LMS) and databases, provides technical support to students, instructors, and support staff, and manages LMS user accounts and network security.
- Instruction Stage - instructional and support services staff (e.g., course instructor, technical and administrative staff) are the people involved in delivering the instructional product.
- Marketing Stage - with the emergence of the e-learning industry, the market has become highly competitive. As such, institutions must provide marketing for their e-learning products to become competitive and provide a good return-on-investment in e-learning.

Figure 1. The Iterative Process of E-Learning



Source: Khan (2004, p. 35)

Traxler (2005) states that m-learning utilizes handheld devices (e.g., mobile phones) to facilitate and enhance the learning process. Ibid. (2005) also says that inevitable confusion between the terms of e-learning and m-learning may exist in the literature. Laouris and Eteokleous (2005) bring up based on their research (partly on the literature research) that there are potential differences between e-

and m-learning in terms of pedagogical approach, modes of communication between actors and methods of evaluation. Nedungadi and Raman (2012, p. 659) claim that most personalized learning systems are designed for either personal computers (e-learning) or mobile devices (m-learning), and as such, may demand some sort of integration between e-learning and m-learning. Simultaneously, in another article, m-learning as a part of e-learning, whereas e-learning is a part of a broader distance-learning (d-learning). D-learning has the main characteristic of distance and time between students and teachers that has more than one hundred years of experience and traditions (Georgiev et al., 2004). Traxler (2005) summarizes in the research that certain areas of e-learning and m-learning may be similar (such as the use of tablet PCs). In contrast, other characteristics are different (such as the use of SMS in m-learning and the use of PC in the e-learning).

2.2. Learning Management System (LMS) – Moodle

Isakowitz et al. (1998) define "Web-based information systems" as Information Systems based on Web technology, requiring new approaches to design and development compared to traditional computer software. There are several e-learning systems types, one of which is a Learning Management System (Sheshasaayee and Bee, 2017, p. 736). Learning Management System (LMS) is a powerful software system enhancing learning (Brusilovsky, 2003). LMS provides an automated mechanism to deliver course content and track learning progress (Dalsgaard, 2006). There are two types of LMS: open-source and closed-source, with open-source LMSs are generally free of charge and customizable based on the user preferences at a low cost (Bansode & Kumbhar, 2012, p. 415). Furthermore, Moodle-based e-learning programs can be used to enable teachers to enrich students' learning experiences (ibid, 2012, p. 415). Moodle is mentioned as the widely used LMS in higher education (Machado and Tao, 2007; Teo et al., 2019). Moodle's initial prototypes were created by Martin Dougimas in 1999, with Moodle 1.0 being released in August 2002 (Moodle, 2020). Figures 2 to 4 below show the screenshots of the user interface (UI) of Moodle of Åbo Akademi University in its several parts: login page, the main page of the Moodle and the course space of one of the courses on Moodle.

Figure 2. Login page of Moodle.

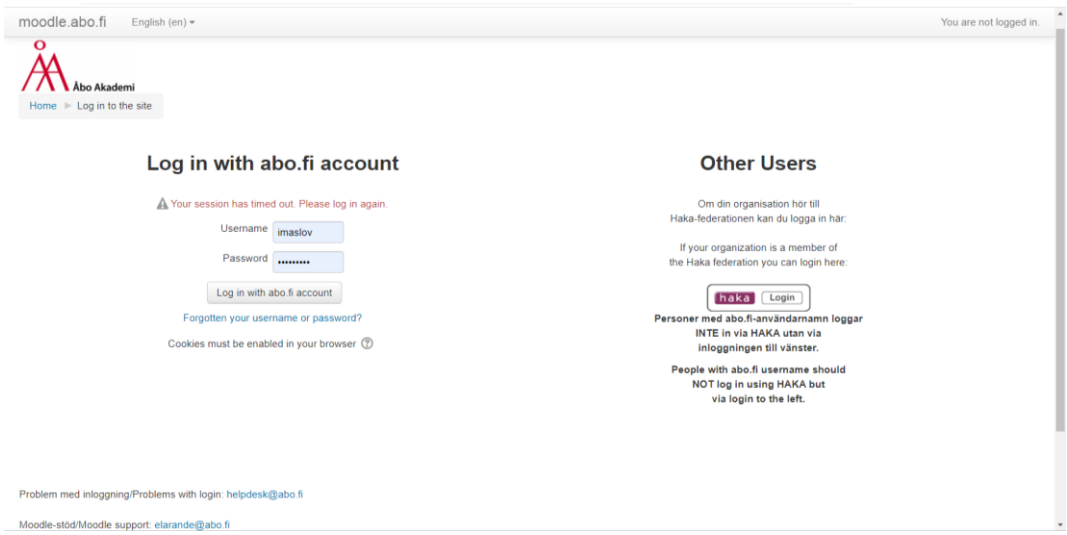


Figure 3. The main page of Moodle.

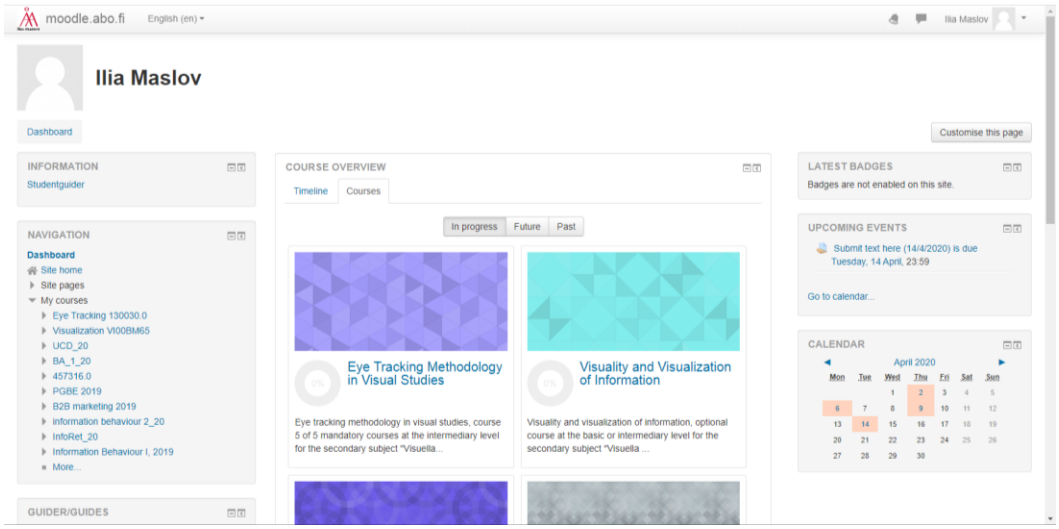
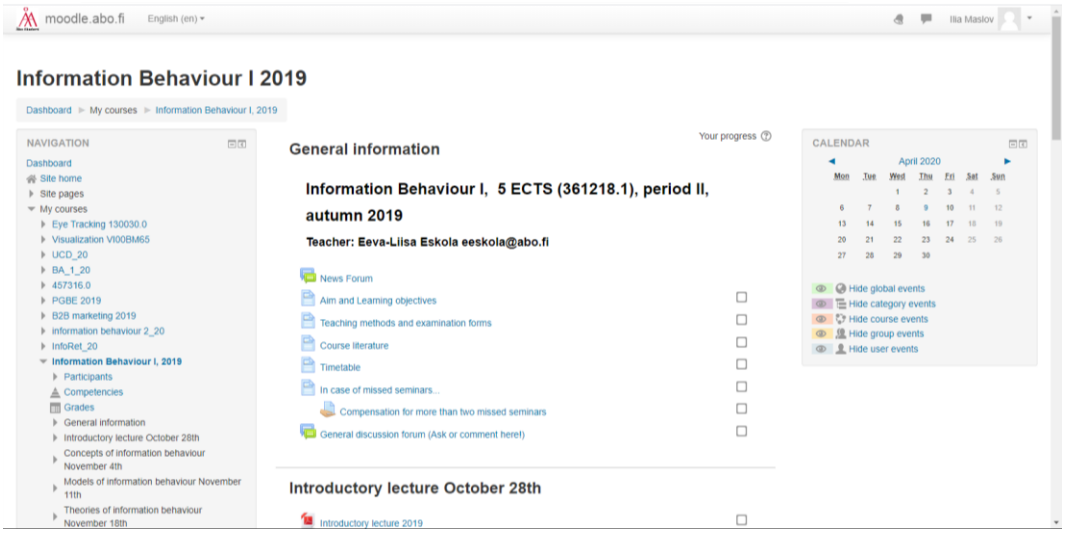


Figure 4. Course space on Moodle.



Sheshasaayee and Bee (2017, p. 738) characterize Moodle in the following way: *"Moodle helps to find optimal ways of learning and optimal learning results. Moodle system plays a vital role in terms of measuring student's knowledge skills and disciplinary practices. Moodle log files help the instructors to preprocess the data, predict learning strategies, and summarize the website structure according to the learner's interest by applying mining techniques. Using the Moodle system makes the learning processes easier and more interesting."*

On the official website, Moodle is described as having a highly customizable software core with a list of features (Moodle, 2019). General Features of Moodle include (Moodle,2019):

- Modern, easy to use interface, which is designed to be responsive, accessible, and easy to navigate on both desktop and mobile devices.
- Personalized dashboard displaying current, past, and future courses, along with tasks due.
- Collaborative tools that allow to work and learn together in forums, wikis, glossaries, database activities.
- Calendar tool that helps to keep track of academic or company calendar, course deadlines, group meetings, and other personal events.
- Convenient file management – to manage files on cloud storage services including MS OneDrive, Dropbox, and Google Drive.
- Simple and intuitive text editor to format text, add media and images with an editor that works across all web browsers and devices.
- Notifications, which, when enabled, allows users to receive automatic alerts on new assignments and deadlines, forum posts and also send private messages to each other.
- Tracking progress – educators and learners can track progress and completion with a list of options for tracking individual activities or resources and at the course level.

Administrative Features, according to Moodle (2019) are:

- Customizable site design and layout
- Secure authentication and mass enrolment to courses.
- Multilingual capability to allow users to use Moodle in multiple languages.
- Bulk course creation and backup.
- Manage user roles, access, and permissions.
- Moodle supports open standards, which means an ability to import and export IMS-LTI, SCORM courses.
- High interoperability of the content.
- Simple plugin management.
- Regular security updates.
- Detailed reporting and logs to view and generate reports on activity at course and site level.

Course Development and Management Features include (Moodle, 2019):

- Direct learning paths to design and manage courses to meet various requirements.
- Encourage collaboration through features that foster engagement and encourage content-driven collaboration.
- Embed external resources and multimedia integration in the course content.
- Group management to let groups of learners to share courses, differentiate activities, and facilitate teamwork.
- Marking workflow - Conveniently assign different markers to assignments, manage grade moderation, and control when marks are released to individual learners.
- In-line marking allows easy review and provides in-line feedback by annotating files directly within the browser.
- Peer- and self-assessment through built-in activities such as workshops and surveys to encourage learners to view, grade, and assess their own and other course members' work as a group.
- Integrated badges features, which are fully compatible with Mozilla Open Badges, motivate learners, and reward participation and achievement with customized badges.
- Outcomes and rubrics that select from advanced grading methods to tailor the grade book to the course and examination criteria.
- Competency based marking, allowing to set up competencies with personal learning plans across courses and activities.
- Security and privacy allowing to teach and share in a private space.

Al-Ajlan (2012, p. 193) in Figure 5 below represent a typology summary of generic features of LMS. Moodle lacks two features (Company Profile and Bookmarks), which is the least missing features number among 10 other LMSs in a study by Al-Ajlan (2012).

Figure 5. Features of LMS

1) Learner Tools	2) Support Tools	3) Technical Specifications
1. Communication Tools ▪ Discussion Forums ▪ File Exchange / Internal Email ▪ Online Journal/Notes ▪ Real-time Chat ▪ Video Services / Whiteboard	**1. Administration Tools** ▪ Authentication ▪ Course Authorization ▪ Registration Integration ▪ Hosted Services	**1. Hardware/Software** ▪ Client Browser Required ▪ Database Requirements ▪ Server Software ▪ UNIX Server ▪ Windows Server
2. Productivity Tools ▪ Bookmarks ▪ Orientation / Help ▪ Searching Within Course ▪ Calendar / Progress Review ▪ Work Offline/Synchronize	**2. Course Delivery Tools** ▪ Course Management ▪ Instructor Helpdesk ▪ Online Grading Tools ▪ Student Tracking ▪ Automated Testing and Scoring	**2. Pricing/Licensing** ▪ Company Profile ▪ Costs ▪ Open Source ▪ Optional Extras ▪ Software Version
3. Student Involvement Tools ▪ Groupwork ▪ Self-assessment ▪ Student Community Building ▪ Student Portfolios	**3. Curriculum Design** ▪ Accessibility Compliance ▪ Course Templates ▪ Curriculum Management ▪ Customized Look and Feel ▪ Instructional Standards Compliance ▪ Instructional Design Tools ▪ Content Sharing / Reuse	

Source: Al-Ajlan (2012, p. 193)

Lamichhane et al. (2019) state that the Minimum Viable Product (i.e., a minimum set of features that are required for the proper functioning of the IS) of an LMS are:

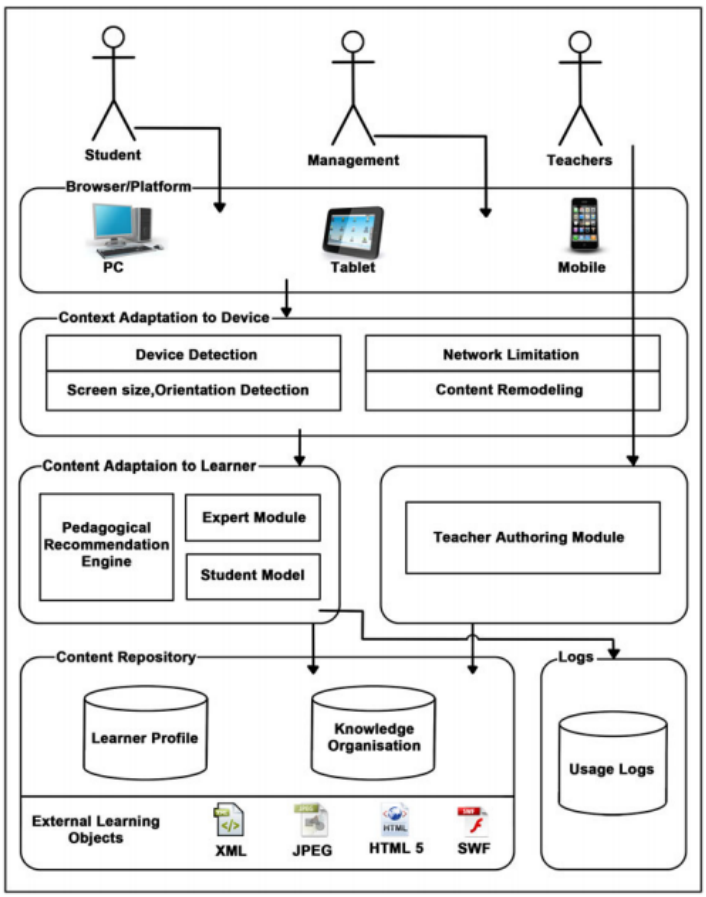
- A user interface (UI), user authentication, and dashboard
- Discussion forum for teachers and students with the feature of messaging and video sharing
- Content attachment feature for slides, pdf and video tutorials
- Navigation and search bar

Evaluating on the five parameters of LMS, Cavus & Zabadi (2014) stated the following regarding Moodle's features:

- Whiteboard/Video Services - Moodle has the best whiteboard feature amongst the six LMS.
- Discussion Forum - Moodle has a very active discussion forum. There are four basic forum types in the Moodle community that help both students and teachers exchange ideas through posting comments and organizing workshops.
- File exchange/Internal Mail – is excellent in providing easy ways for teachers to present materials to their students. Files are uploaded and accessed via Moodle. The only thing that is required from students is to have the right software to open the files.
- Online Journal Mail - Moodle has a journal module available, providing a text area where students type in, which can also be revisited and updated.
- Real-Time Chat - is available to enable participants to have a real-time synchronous discussion in a Moodle course.

Adaptive learning and assessment system (ALAS) is a research-based solution to provide individualized education and training to school students. ALAS has major modules, represented in Figure 6 below. As such, ALAS helps to adapt the content to the learner (based on the technical characteristics of the user's device, initial knowledge evaluation, user preferences and the progress of the learner), to author the educational content for the teachers, and to store and retrieve content, information about the learner and the log data. ALAS could also help to integrate e-learning and m-learning because it can be utilized across different devices. (Nedungadi and Raman, 2012). ALAS could be used as an example of the model visualizing an LMS that provides individualized learning to understand the interrelation of the elements of an LMS.

Figure 6. Adaptive learning and assessment system (ALAS)



Source: Nedungadi and Raman (2012, p. 663)

Students prefer Moodle because the interface is clean, the content is all place in the same page, and it is most comfortable to follow among the three tested LMSs (ILIAS and Atutor) as reported by the respondents in one research (Hock et al., 2015, p. 3). As Cavus & Zabadi (2014) puts it, Moodle (together with ATutor) has the best communication tools with a user-friendly interface among the six tested open-source LMSs.

2.3. User Experience (UX) and usability

According to the U.S. Code § 8541. Definitions, "*The term "end-user," concerning a good, service, or technology, means the person that receives and ultimately uses the good, service, or technology*." Kujala and Kauppinen (2004) state users are individuals who will be interacting with the system while customers are persons who pay for the system. In the contemporary study, (end-)user is defined as an individual who is using an LMS in the process of e-learning. For the most part, it is an enrolled student at Åbo Akademi University using Moodle as part of his/her studies at the university. There are, however, other potential (end-)users of LMSs, which are not in the main focus in contemporary research – teachers and administrators.

According to Pallot and Pawar (2012), Alben (1996) was the first to introduce UX in the context of interactive products: "*UX covers all the aspects of how people use an*

interactive product – the way it feels in their hands, how well they understand how it works, how they feel about it while they are using it, how well it serves their purposes, how well it fits into the context in which they are using it, and how well it contributes to the quality of their lives." Norman (1999) describes UX as a concept, which includes all facets of the user's interactions with a product: how the product is perceived, learned, and used. ISO FDIS 9241-210 defines the UX as *"a person's perceptions and responses that result from the use or anticipated use of a product, system, or service. UX is a combination of all users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors and accomplishments that occur before, during and after the use of product, system or service."* By UX, it is meant how a product behaves and is used by people in the real world. UX is about how people feel about a product and their pleasure and satisfaction when using it, looking at it, holding it, and opening or closing it. One cannot design UX or sensual experience; one can only design for a UX or sensual experience by creating design features that evoke it (Sharp et al., 2007, p. 15). The concept of UX includes the range of human responses that would be measured to include pleasure and the circumstances in which they would be measured to include anticipated use and reflection on use (Bevan, 2009).

Law et al. (2014) state that due to UX subsuming "a range of fuzzy experiential qualities (EQs) such as happiness, disgust, surprise, and love," there are inevitable issues with claiming and discussing accurate measurability of UX. According to Law et al. (2009), when the User Experience is mentioned, caution must be taken. UX is seen as something desirable, though what exactly something means remains open and debatable. There are three reasons why it is hard to get a universal definition of UX, who is basing this statement on other authors (ibid., 2009). The first reason is that UX is associated with a broad range of fuzzy and dynamic concepts, including emotional, affective, experiential, hedonic, and aesthetic variables (Hassenzahl & Tractinsky, 2006). The second reason is that the unit of analysis for UX is too malleable, ranging from a single aspect of an individual end-user's interaction with a standalone application to all aspects of multiple end-users' interactions with the company and its merging of services from various disciplines (Sward, 2006). The third reason is that the landscape of UX research is fragmented and complicated by diverse theoretical models with different foci such as pragmatism, emotion, affect, experience, value, pleasure, beauty, hedonic quality, etc (Cockton, 2008).

Furthermore, Law et al. (2014) state that there are two opposing views (i.e., quantitative and qualitative) of how UX should be studied – an argument rooted in the classical philosophical debate on reductionism versus holism. Fenko et al. (2010, p. 34) state that UX changes over time (from the moment of purchase up to one year of usage). Norman (2009) also claims that the memory of the product usage is influential in forming the evaluation of the UX of the product. Ibid. (2009) also outlined that many users could not remember all the details of their experiences when asked to evaluate these experiences after using the product.

Usability is generally regarded as ensuring that interactive products are easy to learn, effective to use, and enjoyable from the user's perspective. Usability has several goals: effective to use (effectiveness), efficient to use (efficiency), safe to use (safety), having good utility (utility), easy to learn (learnability), easy to remember

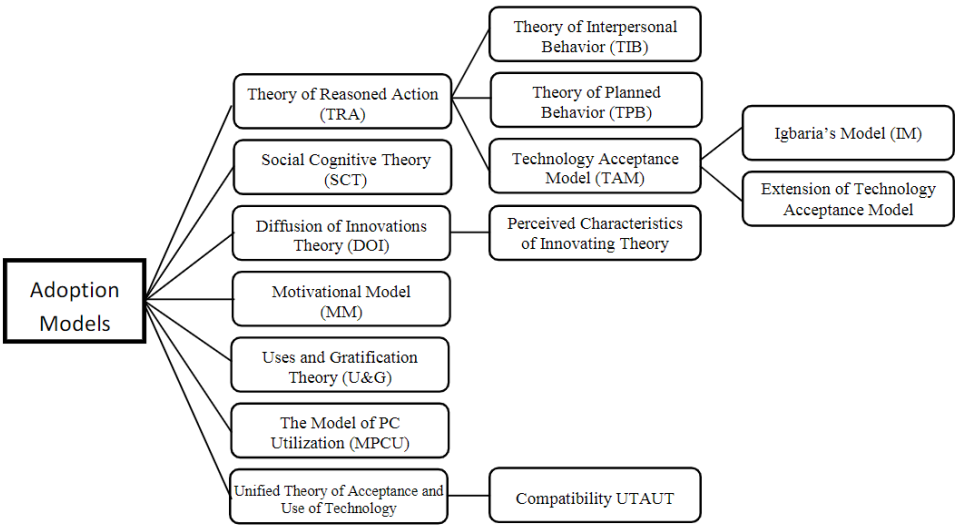
how to use (memorability) (Sharp et al., 2007, p. 20). Bevan (2009) state that usability could be considered as a part of UX, or as a separate concept measuring the use of the product objectively, whereas then UX is entirely subjective. Ibid. (2009) state that there are two distinct objectives, regardless of terminology: optimizing human performance and optimizing user satisfaction with achieving both pragmatic and hedonic goals.

In general, there is no fundamental difference between measures of usability and UX. However, the difference in emphasis between task performance and pleasure leads to different concerns during user-centered design development. There are two typical UX concerns during development. First is understanding and designing the user's experience with a product: how people interact with a product over time, what they do, and why. Second is maximizing the achievement of the hedonic goals of stimulation, identification, and evocation and associated emotional responses. There are four typical usability concerns during development. The first is designing for and evaluating overall effectiveness and efficiency. The second is designing for and assessing user comfort and satisfaction. The third is designing to make the product easy to use and evaluate the product to identify and fix usability problems. The fourth is when relevant, the temporal aspect leads to a concern for learnability (Bevan, 2009).

Additionally, Pallot et al. (2014) refer to the efficiency and effectiveness as parts of a holistic UX model, together with hedonic and sensual attributes affecting the UX. For the purposes of this research, usability and UX are to be considered closely interrelated concepts, with UX being more comprehensive and which includes usability. Usability is to be considered to be more concerned with the efficiency of use, whereas UX is more concerned with the good experience of use overall. Contemporary research will focus on the UX, of which some parts such as efficiency could be considered both as properties of UX and as parts of the usability.

In short, from the literature it may be concluded that UX is a multi-factor complex phenomenon, primarily subjective and based on the person's perceptions with difficulties in outlining the borders of components of the phenomenon, which are fuzzy, changing over time, and with different (sometimes contradicting) approaches to studying the UX. This must be kept in mind when designing research, collecting the data, analyzing it, and interpreting the results of the analysis. However, gladfully, the literature suggests specific laid-out models that study with some degree of accuracy the complex phenomenon of UX. Taherdoost (2018) presents an overview of the most popular models representing adoption/acceptance of technology by users in the literature (Figure 7 below).

Figure 7. Adoption Models



Source: Taherdoost (2018)

Topolewski et al. (2019) state that most of the identified aspects of adoption/acceptance of technology by users are subjective, such as perceived usefulness, perceived ease-of-use, and whether the technology meets the user's expectations. Terzis and Economides (2011) present a tabulated form of the major constructs of the models, as well as literature that supports evidence of the existence of these constructs (Figure 8).

Figure 8. Previous IT acceptance models

Model	Major constructs	Support evidence
Theory of Reasoned Action (TRA)	Attitudes, subjective norms	Fishbein and Ajzen (1975)
Technology Acceptance Model (TAM)	Perceived Usefulness, Perceived Ease of Use	Davis (1989)
Motivational Model (MM)	Extrinsic Motivation, Intrinsic Motivation	Davis et al. (1992)
Social Cognitive Theory (SCT)	Personal Factors (cognitive, affective, biological), Behaviour factors, Environmental factors	Bandura (1986) and Compeau and Higgins (1995)
Theory of Planned Behaviour (TPB)	Perceived Behavioural Control	Ajzen (1991)
Innovation Diffusion Theory (IDT)	Relative Advantage, Ease of Use, Image, Compatibility, Results Demonstrability	Moore and Benbasat (1991) and Rogers (2003)
The Model of PC utilisation (MPCU)	Complexity of PC use, Job Fit With PC Use, Long-Term Consequences of PC Use, Affect Toward PC Use, Social Factors Influencing PC Use, Facilitating Conditions for PC Use	Thompson et al. (1991) and Triandis (1977)
Combined TAM and TPB (C-TAM-TPB)	Perceived Usefulness, Perceived Ease of Use, Perceived Behavioural Control	Taylor and Todd (1995)
Task Technology Fit model (TTF)	Task Requirements, Tool Functionality, Individual Performance	Goodhue and Thompson (1995)
Integrated TAM/TTF model	TAM + TTF constructs	Dishaw and Strong (1999)
TAM2	TAM + Subjective Norm	Venkatesh and Davis (2000)
Unified Theory of Acceptance and Use of Technology (UTAUT)	Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Gender, Age, Experience, Voluntariness	Venkatesh, Morris, Davis, and Davis (2003)

Source: Terzis and Economides (2011).

Terzis and Economides (2011) present a table (Figure 9) with previous studies that have used earlier constructs from the basic models in their proposed models regarding LMS acceptance. As can be seen, related causal links consist of a simplistic relationship between a few elements that constitute the intention to use an LMS. As it was previously discussed, UX is a complex and multi-factor concept, which may demand a more holistic approach.

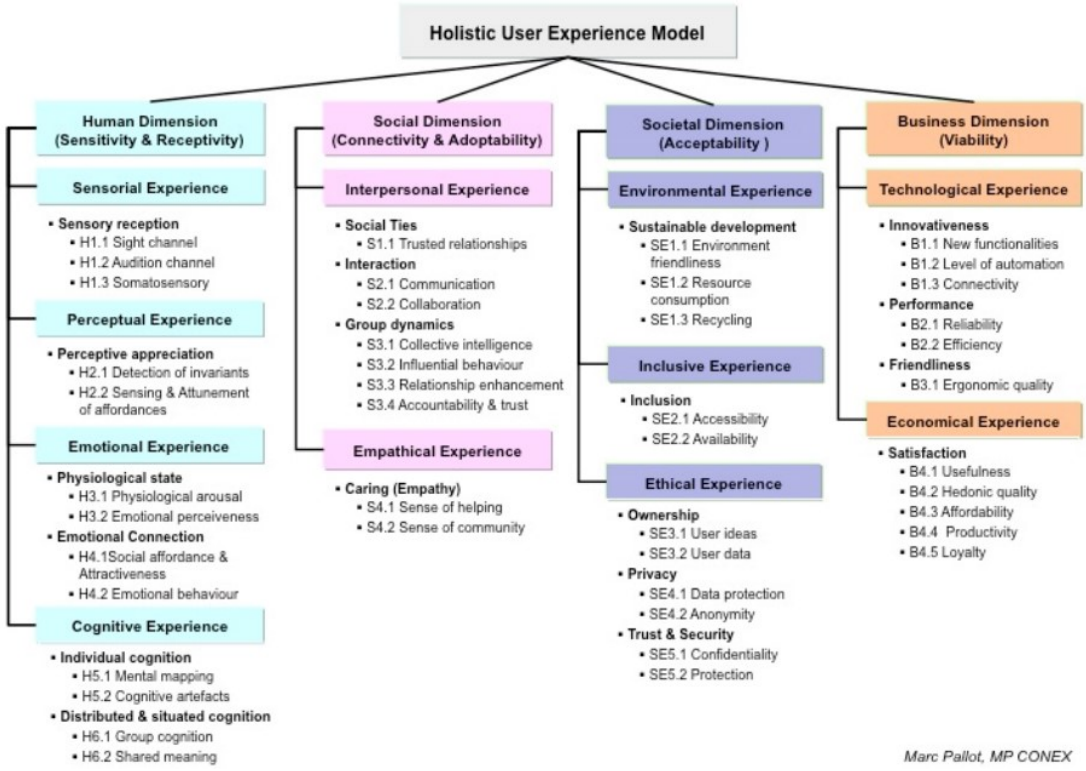
Figure 9. Studies that used constructs from IT acceptance to LMS acceptance

Construct	Related causal links	Support evidence
Perceived Usefulness	PU → Intention to Use	Ong et al. (2004), Padilla-Melendez et al. (2008), Ong and Lai (2006), Landry, Griffeth, and Hartman (2006), Teo (2009), Yi and Hwang (2003), Van Raaij and Schepers (2008) and Lee (2008)
	PU → Attitude	Ngai, Poon, and Chan (2007)
Perceived Ease of Use	PEOU → Intention to Use	Ong et al. (2004), Padilla-Melendez et al. (2008), Ong and Lai (2006), Landry, Griffeth, and Hartman (2006), Teo (2009), Yi and Hwang (2003), Van Raaij and Schepers (2008), Liao and Lu (2008) and Lee (2008)
	PEOU → Attitude	Ngai, Poon, and Chan (2007)
Social Influence	SI → Intention to Use	Wang et al. (2009), Van Raaij and Schepers (2008)
Computer Self-Efficacy	CSE → Intention to Use	Padilla-Melendez et al. (2008)
	CSE → PU, PEOU	Ong et al. (2004), Ong and Lai (2006) and Teo (2009)
Facilitating Conditions	FC → Attitude	Teo (2009) and Teo, Lee, and Chai (2008)

Source: Terzis and Economides (2011).

UX could be evaluated based on 11 UX facets across 4 UX dimensions, as shown in the holistic UX model (Figure 10), which has been reviewed in a series of research, originating from EU-funded project in 2009 (Pallot & Pawar, 2012, Pallot et al., 2014).

Figure 10. Holistic UX model

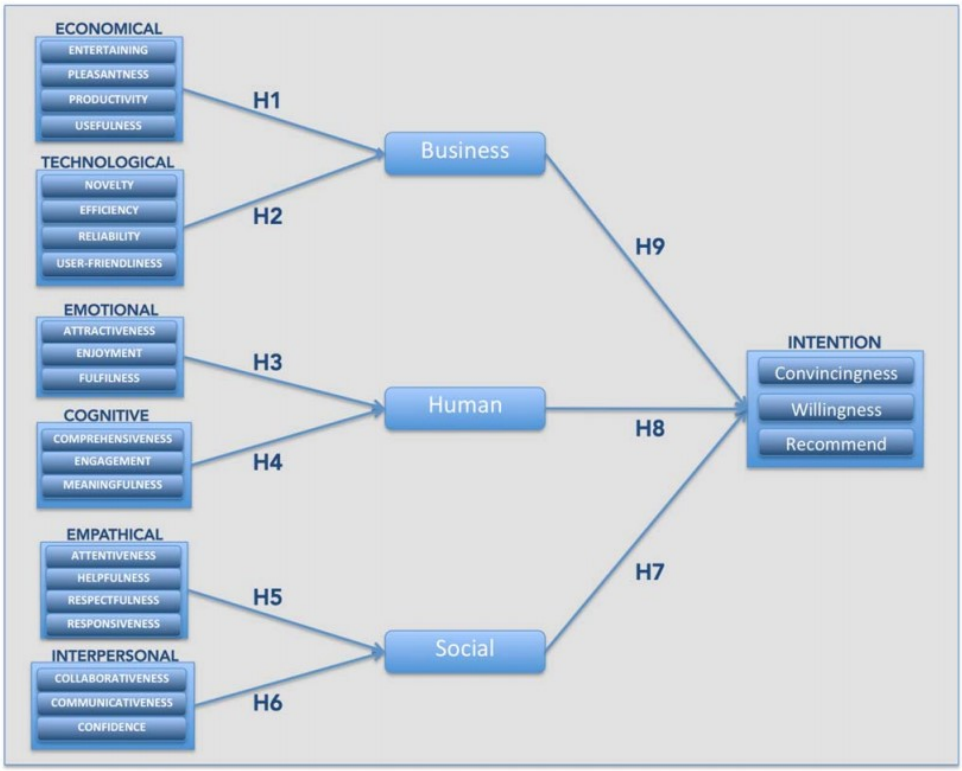


Source: Pallot et al. (2014)

Topolewski et al. (2019) cite and validify the UX model (Figure 11 below), which is applied in the context of using a mobile app. Ibid. (2019) bring up that the TAM3 model could be upgraded with UX dimensions, facets, and properties, where the intention-to-use and its three factors are affected by the UX dimensions. Ibid. (2019) describe 21 UX properties in Figure 12. UX model is verified quantitatively for all of the hypotheses, with the exception for the hypothesis that Interpersonal facet is affecting Social Dimension (H6). Results showed that Business, Human and Social dimensions impact users' potential intention to use (Topolewski et al., 2019).

Business dimension denominates the Viability of the product; Social dimension denominates Connectivity & Adoptability; Human dimension denominates Sensitivity & Receptivity (Pallot et al., 2014). Titling of the facets and dimensions may be argued, since, for example, "Business dimension" in of itself might not be applicable to the software provided by the university. Still, for the lack of better wording, these titles are accepted due to the fuzzy nature of UX elements that are hard to define.

Figure 11. UX research model



Source: Topolewski et al. (2019).

Figure 12. UX properties' descriptions

UX Property	Description
Entertaining	Degree to which the app entertains users
Pleasantness	Degree to which the app is pleasant to use
Productivity	Degree to which the app helps users to be more productive
Usefulness	Degree to which the app allows users to carry out specific tasks
Novelty	Degree to which the app is new to the user
Efficiency	Degree to which the app allows users to be efficient
Reliability	Degree to which the app is reliable
User-Friendliness	Degree to which the app is easy-to-use and intuitive enough
Attractiveness	Degree to which the app is visually attractive
Enjoyment	Degree to which the app is enjoyable
Fulfillment	Degree to which the app allows users to achieve properly a task
Comprehensive-ness	Degree to which the app allows users to understand others
Engagement	Degree to which the app allows users to engage in their task
Meaningfulness	Degree to which the app allows users to provide meaningful results
Attentiveness	Degree to which the app allows users to be attentive to others
Helpfulness	Degree to which the app allows users to help others
Respectfulness	Degree to which the app allows users to be respectful of others
Responsiveness	Degree to which the app allows users to be responsive to others
Collaborativeness	Degree to which the app allows users to collaborate with others
Communicative-ness	Degree to which the app allows users to communicate to others
Confidence	Degree to which the app allows users to trust others

Source: Topolewski et al. (2019)

Simultaneously, another mixed methods research by Krawczyk et al. (2019) utilized the same dataset as in the research by Topolewski et al. (2019), and in the data many qualitative responses were contradicting quantitative responses. It is speculated that mixed methods allowed to partially eliminate the bias of the respondents of not understanding the question correctly, giving too little thought into it, or over-under-evaluating the answers (Krawczyk et al., 2019). Hence, it is believed that in order to tackle the problem of receiving proper evaluations of UX, the methodology should be properly adjusted, such as having mixed methods to improve the validity and reliability of the results.

Krishnamurthy et al. (2010, p. 149) state that during the software development of e/m-learning systems, usability and user acceptance are considered highly important because people with varied skillsets use these systems (e.g., Admin, Students, and Teachers). Simultaneously, Ardito et al. (2014, p. 1) state that in too many software development companies, usability and UX are either neglected or not properly considered. Ibid. (2014, p. 21) state that to resolve this situation, public organizations must explicitly mention usability and UX requirements in the Calls for Tenders for ICT products. Additionally, Nakamura et al. (2017a) state that none of the existing research in usability and UX of LMSs proposed solutions to the identified issues in usability and UX of studied LMS.

Certain conclusions may be made from this section of the literature review. Firstly, UX of an LMS was not explored through the holistic UX model, but rather through TAMs, which focus on narrower parts of UX, hence fostering a reductionist point of

view, which may fail to explain certain parts of UX as compared to the holistic view. Furthermore, UX of an LMS was not studied in a pragmatical context, with the goal of providing potential solutions to the identified issues. Secondly, the research gap lies in the lack of knowledge, whether UX of an LMS could be explored effectively using the model. As a result, the research gap of applying the holistic UX model to explore the UX of an LMS in the context of e-learning is found, which shall be addressed by contemporary research.

2.4. Gender Differences in e-learning and the use of LMSs

Previous research in the field of studying e-learning assumes two genders (Ong and Lai, 2006; Kuo et al., 2019; Wang et al., 2009). Some recent research in other fields may acknowledge some possibility of variability in terms of gender, for example, the so-called "transgender umbrella term," described by Davidson (2007). However, the academic practice in studying the gender differences in e-learning based on two genders is yet to be disputed. As such, the contemporary study will also assume the person's gender to be a categorical value with two variables: male or female.

There is some research conducted in the past regarding the evaluation of gender differences in e-learning and the use of LMSs. González-Gómez et al. (2012) state that there are few differences between male and female students in their use of e-learning and their motivation and satisfaction. Aufderhaar et al. (2019, p. 66) claim that gender difference has no significant impact on the typical UX factors of different website designs. Alkhaldi and Al-Sa'di (2018, p. 13) state that men could interpret the technical savviness of the web banner – for example, evaluating the present visual and audio features. Simon (2000, p. 18) concludes that the perception and satisfaction of the website may differ within cultural clusters and gender groups. Men's rating of computer self-efficacy, perceived usefulness, perceived ease of use, and behavioral intention to use e-learning are all higher than women. Women were more strongly influenced by perceptions of computer self-efficacy and ease of use, and that men's usage decisions were more significantly influenced by their perception of the usefulness of e-learning. Thus, factors of gender must be considered in the development and testing of e-learning theories (Ong and Lai, 2006).

A pilot study was conducted to understand whether students are satisfied with the integration of an educational reward system called Trading Card Game with Moodle and whether the integration may be used to engage students in learning. As long as the system is useful, both male and female students would like to access the information on the in-game card reward that they received in the Trading Card Game from Moodle (Kuo et al., 2019). Finally, gender differences moderate the effects of social influence and self-management of learning on m-learning use intention. Social influence on usage intention is significant for men but insignificant for women. The effect of self-management of learning on intention was moderated by gender such that it was more significant for women than for men (Wang et al., 2009). To conclude, the previous research bears contradicting findings. Given that there's no conclusive answer to whether there is any gender difference in the UX of an LMS in the context of e-learning, the research gap shall be covered by contemporary research.

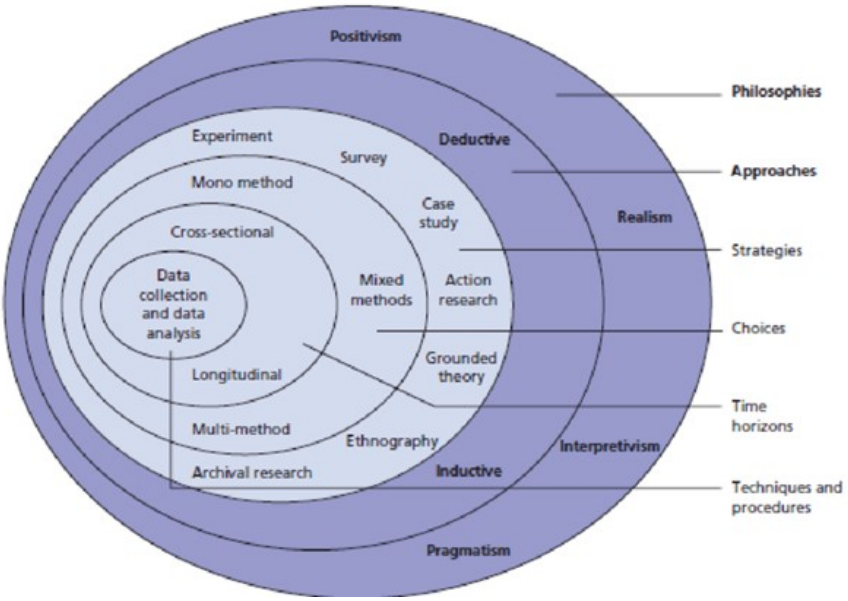
3 Methodology

In the following section, Research Design, and methodology of the data collection and data analysis are provided in high detail. At the end of this section, a shorter methodology summary is provided.

3.1. Research Design

Saunders et al. (2009, p. 108) provide a research onion (Figure 13), which demonstrates possible research approaches that affect the data collection and data analysis of the research. The following decisions were made in this research starting from the outside and going to the center of the research onion: pragmatism, deduction, survey, mixed methods (qualitative-driven), cross-sectional, qualitative, and quantitative data (due to mixed methods approach).

Figure 13. The research 'onion'



Source: Saunders et al. (2009, p. 108)

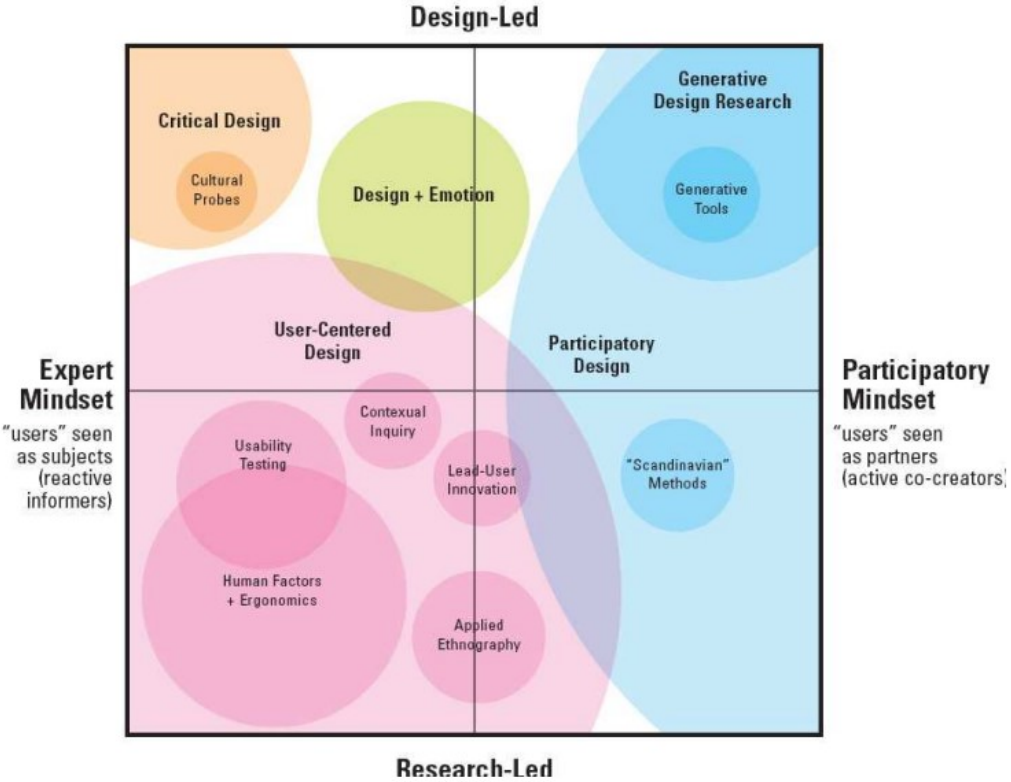
Pragmatics recognize that there are many ways of interpreting the world and undertaking research. According to pragmatics' perspective, no single point of view can ever give the entire picture and that there may be multiple realities. Values play a significant role in interpreting the results in pragmatism, with the researcher adopting both objective and subjective points of view. The focus in this philosophy is on practical applied research, integrating different perspectives to help interpret the data (Saunders et al. 2009, p. 109). In terms of analyzing UX, which is highly subjective, the researcher would have to immerse oneself deeply into multiple points of view, and as such pragmatism is chosen as a philosophy.

In a deductive approach, theory and hypotheses are developed for testing in which a research strategy is designed (as opposed to an inductive approach, where a theory is developed based on data). Additionally, it is an essential feature of a deductive study to impose controls in order to test for the hypothesis, to

operationalize the terms, and to be able to somehow generalize to a larger population (Saunders et al. 2009, p. 124-127). Simultaneously, Saunders et al. (2009, p. 127) state that it is often advantageous to combine deductive and inductive approaches within the same research. On the one hand, a deductive approach is about using an existent verified theory, relying on quantitative data and being highly scientific and, as such, supposedly highly reliable and valid. On the other hand, inductive research, is more about gaining an understanding of the meanings of humans attaching to events, relying on qualitative data, and a realization that the researcher is part of the research process (Ibid., 2009, p. 127). In the context of analyzing UX, it is crucial to recognize the value of following existent frameworks, which are to help to measure the phenomenon validly and reliably. At the same time, UX is highly subjective. When a qualitative approach is used as an exploratory tool, it may deem indeed beneficial to have certain inductive elements to the research.

Human-centered design (HCD) advocates that a more promising and enduring approach is to model users' natural behavior to begin with so that interfaces can be designed that are more intuitive, easier to learn, and freer of performance errors (Oviatt, 2006). Norman (2005) states that human-centered design (HCD) was developed to overcome the poor design of software products. However, ibid. (2005) also says that there are potential problems with HCD, related to too much centricity on the user. Sanders & Stappers (2008) have provided a visual representation of the domain landscape of human-centered design research, shown in Figure 14 below.

Figure 14. Domain Landscape of Human-Centered Design (HCD) Research



Source: Sanders and Stappers (2008)

Sanders and Stappers (2008, p. 5) state that the user-centered design (UCD) is one in which *"trained researchers observe and/or interview largely passive users, whose contribution is to perform instructed tasks and/or to give their opinions about product concepts that were generated by others.*" Abras et al. (2004, p. 445) have characterized 'User-centered design' (UCD) as *"a broad term to describe design processes in which end-users influence how a design takes shape. It is both a broad philosophy and variety of methods. There is a spectrum of ways in which users are involved in UCD, but the important concept is that users are involved in one way or another."* Norman and Draper (1986) are the authors who have initially coined the term UCD. Sanders and Stappers (2008) characterize UCD as a part of the HCD landscape. However, it is essential to mention that some researchers (Gasson, 2003) might consider HCD as a contrary practice to UCD. As such, there might be some conflicts in understanding definitions and defining the relationships between them. For this research, Sanders and Stappers' (2008) understanding will be adopted.

A user-centered design (UCD) approach is contrary to the participatory approach, whereby users are *"given more influence and room for an initiative in roles where they provide expertise and participate in the informing, ideating, and conceptualizing activities in the early design phases."* (Ibid., 2008, p. 5). Co-creation is a broad term, referring to any act of collective creativity, i.e., a creativity that is shared by two or more people, with applications ranging from the physical to the metaphysical. Co-design is collective creativity as it is applied across the whole span of a design process, and co-design is a specific instance of co-creation (Sanders & Stappers, 2008). The contemporary research is to be primarily concerned with user-centered design, whereby the users are more seen as the passive contributors of their perspective. However, there are some aspects of co-creation represented in the potential acquisition of the user-generated ideas regarding the possible improvements of the existing product.

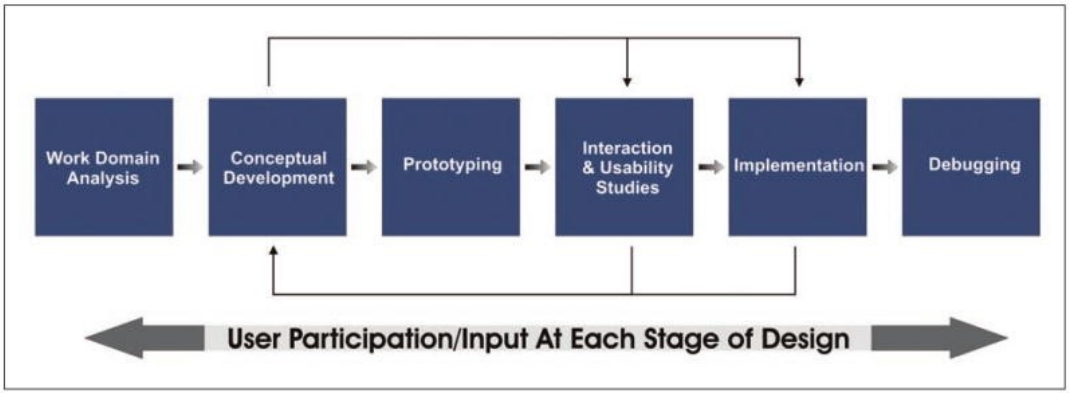
Abras et al. (2004, p. 446) state that users are a central part of the product development process. Ibid. (2004) continue that the designer's role in the UCD is about facilitating the use of the product as intended with the minimum effort of learning how to use it. Sanders (2002) has claimed that the social scientist or researcher serves as the interface between the user and the designer in the user-centered design process. As put by ibid. (2002), the researcher collects primary data or uses secondary data to learn about the needs of the user, with the consequent interpretation of the information, which is then proceeded to the designer of the product.

Robinson et al. (2005) have proposed six stages in the UCD process, with user participation or input at every stage. The visual model of the UCD process is shown in Figure 15 below. The six stages that were proposed by the authors are:

1 Work domain analysis – initial communication of ideas and requirements between the client and developer.
2 Conceptual development – outlining desired features that come from understanding the work domain.
3 Prototyping – working models of the application are created, potentially concurrent with interaction/usability studies, the following stage.

4 Interaction/usability studies are concerned with understanding the pieces of an application that work well, as well as those that need further re-design. Audio, video, as well as interviews and focus groups, may be included that discuss the application.
5 Implementation is the creation of the actual product, with the potential appearance of new problems in the process.
6 The final stage is debugging, whereby the application is adjusted to enhance stability and compatibility and to make the most out of the computing infrastructure in which it has been implemented.

Figure 15. UCD's six-stage process



Source: Robinson et al. (2005).

According to the model by Robinson et al. (2005), the contemporary research should be considered to be at the stage of interaction and usability studies, where the researcher is capturing the data on the use of an LMS with the purpose of consequent analysis and potential improvement of the LMS. For the purposes of contemporary study, debugging is considered to be a part of the stage of interaction and usability studies in the model of Robinson et al. (2005). The choice for such modification is that in principle, in the model by ibid. (2005), after the stage of debugging, there is no potential iterative cycles. This contradicts other researchers, such as Detweiler (2007), who considers UCD to be an iterative process of three phases:

1. Understanding users – observing and interviewing end-users and other stakeholders to gather requirements.
2. Defining interaction – creating use cases based on the output from phase one.
3. UI design – prototypes are iteratively created and evaluated.

As it was previously mentioned, there are several stages to e-learning (Khan, 2004). The contemporary study may be fitted in the "Evaluation" stage of e-learning that attempts to collect learners' feedback about UX of an LMS in order to propose solutions to the identified issues for the use at later stages of e-learning (design, planning, or production). In the UCD, the contemporary study is at the stage of

understanding users in the interaction and usability studies, which then may be used by designers to improve the UX of an LMS.

Preece et al. (2002) suggest techniques of involving users in the design and development of a product, which may be suitable at different stages of UCD, shown in Table 2. If the UCD is considered as a reiterative process, it may be considered that the contemporary research is either at the beginning of the design project (beginning of one of the iterative cycles of product improvement) or at the final stage of the design cycle (when the product is already finished). In both ways, interviews and questionnaires are suggested, albeit with different purposes in mind. If the research is considered as the beginning of the design project, the purpose is to collect the data related to the needs and expectations of users, evaluation of design alternatives, prototypes, and the final artifact. If the research is considered at the final stage of the design cycle, then the purpose is to collect qualitative data related to user satisfaction with the artifact.

Table 2. Techniques for involving users in the design and development of a product

Technique	Purpose	Stage of the Design Cycle
Background Interviews and questionnaires	Collecting data related to the needs and expectations of users; evaluation of design alternatives, prototypes and the final artifact	At the beginning of the design project
Sequence of work interviews and questionnaires	Collecting data related to the sequence of work to be performed with the artifact	Early in the design cycle
Focus groups	Include a wide range of stakeholders to discuss issues and requirements	Early in the design cycle
On-site observation	Collecting information concerning the environment in which the artifact will be used	Early in the design cycle
Role Playing, walkthroughs, and simulations	Evaluation of alternative designs and gaining additional information about user needs and expectations; prototype evaluation	Early and mid-point in the design cycle
Usability testing	Collecting quantities data related to measurable usability criteria	Final stage of the design cycle
Interviews and questionnaires	Collecting qualitative data related to user satisfaction with the artifact	Final stage of the design cycle

Source: Preece et al. (2002)

Nakamura et al. (2017a) state that for usability and UX evaluation of LMSs questionnaires and interviews are widely used research techniques. Interviews are verbal interchanges where the interviewer seeks to retrieve information from another person (interviewee or respondent). There are three types of interviews: structured, semi-structured, and unstructured. Structured follow a predetermined and standardized set of questions; the questions are asked almost in the same manner. Unstructured interviews are at the other end of the continuum: the conversations in these types of discussions are being directed by the informant, rather than by the set of questions. Semi-structured interviews are in the middle of this continuum (Dunn 2005, 79-80.). The most common type of interviews used in qualitative research are semi-structured interviews (Holloway and Wheeler 2010) and involve the use of predetermined questions, where the researcher is free to seek

clarification (Doody & Noonan, 2013). Longhurst (2003, p. 103) states that the interviewer prepares a list of predetermined questions, but semi-structured interviews unfold in a conversational manner offering participants the chance to explore issues they feel are essential. Gray (2004) states that the researcher can explore new paths that emerge during an interview that may not have been considered initially. Doody and Noonan (2013) summarize the advantages and disadvantages of interviews in a tabulated form (Table 3). These are mentioned to make the reader acknowledged of interviews' applicability as a research tool.

Table 3. Advantages and disadvantages of interviews

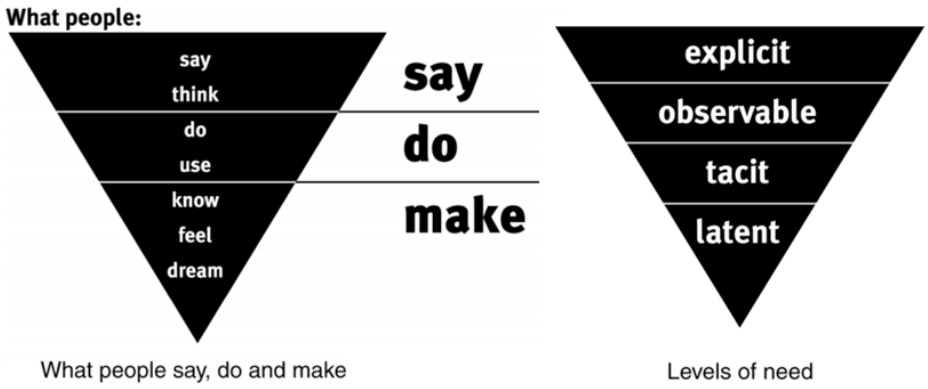
Advantages	Disadvantages
• They are useful to gain insight and context.	• They may seem intrusive to the participant.
• They help participants describe what is important to them.	• They are time-consuming, not only in terms of conducting them but also in relation to arranging them, travelling to the venue, post-interview transcription and analysis of the data.
• They are useful in generating quotes and stories.	• They can be expensive compared with other methods.
• They enable the researcher to develop a rapport.	• Interviews on a personal and/or intimate subject can evoke strong feelings and these feelings need to be handled with great sensitivity.
• They give the researcher the opportunity to observe as well as listen.	• They are susceptible to bias, which may include:
• They enable more complex questions to be asked.	- The participant's desire to please the researcher.
•The researcher can explain the purpose of the research and answer any questions the participant may have about the study.	- Saying what they think/feel the researcher wishes to hear, such as giving an official point of view rather than their personal view.
• The researcher can probe the participant's responses and seek further clarification.	- The desire to create a good impression may lead to participants not answering honestly.
• Participants can seek clarification of a question.	- There is a tendency to say something rather than nothing if the participant cannot answer a question or has nothing to say on a topic.
• They help the participant to give detailed responses.	- The researcher's views can influence the participant's responses by expressing surprise or disapproval.
• Can explore participants' reasons for acting in a certain way or their interpretations of events.	
• They are more appropriate for certain groups, such as those with reading or writing difficulties.	
• Interviews can be a rewarding for participants as they stimulate selfexploration and discovery.	
• Personal benefit: the telling of one's story.	

Source: Doody and Noonan (2013)

Interviews are often used in empirical software engineering research. The purpose of using interviews in empirical studies is often to collect data about phenomena that cannot be obtained using quantitative measures. Interviewing people provides insight into their world, their opinions, thoughts, and feelings (Hove & Anda, 2005). Sanders (2002) has stated that there are many ways researchers can learn from people about their memories, their current experiences, and their ideal experiences, with each route to experience revealing a different story or picture. Additionally, ibid. (2002) state there are different levels of need, starting with explicit (what people say) and observable (what people do) needs, continuing to tacit (how people feel), and latent needs (i.e., those needs which are not recognizable until the future). Sanders (2002) underlines that at a moment when all three perspectives are researched simultaneously, a researcher can get closer to understanding and

establishing empathy with the individuals who use information systems. Figure 16 below shows the combined figures from the article by Sanders (2002) as to what people say, do and make, and the levels of need. Conceptualization of the depth of people's needs and behaviors may be useful to bear in mind when interpreting the results of the interviews, which are asking people to say (other than anything else) how they interact with the LMS, what they think about it and how they feel about it.

Figure 16. Combined figures of what people say, do and make, and the levels of need



Source: Sanders (2002)

Nakamura et al. (2017b) stated that participants in a study of UX of LMS by the use of generically used UX evaluation techniques UEQ (User Experience Questionnaire (Laugwitz et al., 2008)) and IEAM (Integrated Experience Acceptance Model (Van Schaik & Ling, 2011)) reported that the techniques do not provide a field to better express their experiences, focus too broad without specifying which of the features are being evaluated. As such, Nakamura et al. (2017b, p. 1015) determine that to evaluate the UX properly, there's a need for techniques that provide a field where participants can provide a detailed overview of their experiences, observations or difficulties and to provide questions/adjectives specific to the features of LMSs for a better evaluation of the use of LMS in the context.

As it was stated, ISO FDIS 9241-210 defines the UX as *"a person's perceptions and responses that result from the use or anticipated use of a product, system or service."* Thus, interviews may be useful in gaining insights into the opinions, thoughts and feelings, which constitute a UX. Sharp et al. (2007, p. 15) state that UX researchers may carry out ethnographic field studies to research into users' needs and convert them into actionable results. Chi Sig (2009) cited in Bevan (2009) state that data for evaluation of UX could serve user opinion, user interview and user questionnaire. According to Saunders et al. (2008, p. 323), Healey and Rawlinson (1994) cited: *"one section of an interview may ask a common set of factual questions [in a questionnaire- or survey-like manner] … while in another section a semi-structured qualitative approach may be used to explore [responses]"*.

Groves et al. (2011, p. 2) state that a survey is a systematic method for gathering information from (a sample of) entities for the purposes of constructing quantitative descriptors of the attributes of the larger population of which the entities are

members. Ibid. (2011, p. 34) claim that survey methodology is about balancing the investments in each of the components of a survey to maximize the value of the data that will result (in terms of its richness and accuracy).

A qualitative survey is the study of the diversity of member characteristics within a population, in contrast to the statistical survey, which analyzes frequencies in member characteristics. The variety of member characteristics may either be predefined or developed in open coding. The qualitative survey should be considered as a research design, which is different from other qualitative research, such as those proposed by Creswell (1998): biography, phenomenology, grounded theory, ethnography, and case study.

There are three levels of the qualitative survey: uni-dimensional description, multi-dimensional description, and explanatory analysis, developed in either in a concept-oriented or in a unit-oriented fashion. Furthermore, qualitative studies are either inductive or deductive. In the former, relevant objects/topics, dimensions (aspects of objects, variables) and categories (values at dimensions) are identified through interpretation of raw data (e.g. interview transcripts). In the latter, certain dimensions or categories are identified prior to the research. As such, the diversity is outlined in advance, and the purpose of such a study is to see which of the predefined characteristics exist empirically in the population under study (Jansen, 2010).

Cross-sectional studies are carried out at a one-time point or over a short period. Cross-sectional studies are advantageous because they are relatively inexpensive, take little time to conduct, and can estimate the prevalence of outcome of interest, with many results and risk factors that can be assessed. Such studies provide only a snapshot, and the situation may change over time. It is also hard to make a causal inference. (Levin, 2006, p. 24-25). Cross-sectional studies are primarily used to determine prevalence. Prevalence equals the number of cases in a population at a given point in time. Cross-sectional studies are also used to infer causation. Many cross-sectional studies are done using questionnaires. Alternatively, the researcher may interview each of the subjects (Mann, 2003, p. 54-56). This research has limited resources available, thus a cross-sectional study proving to be a satisfactory option. Possible limitations of cross-sectional studies would be taken into account.

Creswell et al. (2003) state that there are different forms of concurrent strategies that converge quantitative and qualitative data for providing a comprehensive analysis of a research issue. Krawczyk et al. (2017) state that in these strategies, both forms of data are simultaneously collected and then integrated for the interpretation of the overall results. Ibid. (2017) continues that in the UX domain, the mixed methods paradigm is an emerging research approach that allows researchers to combine quantitative and qualitative methods into different forms of research strategies. UX research could utilize at first a bipolar UX survey for collecting quantitative rating data representing the level of user satisfaction explained by several UX properties/factors, and then to carry out an interview with a few individuals by collecting qualitative data bringing detailed justifications of their ratings. Such an approach could enable a comprehensive evaluation of UX, which is potentially scientifically rigorous and reliable (Krawczyk et al., 2017). A

study at the early stage proposed a typology of Mixed Methods in the UX, according to which it is possible to evaluate how the quantitative survey response of a user relates to the qualitative comment given at the same time, and whether user's responses should be considered as valid or reliable in the research altogether. Research found that users could potentially give quantitative answers that are not in line with the qualitative statements, and as such, affect the data findings (Krawczyk et al., 2019). The data collected from respondents, which was used to validify the UX model (Topolewski et al., 2019), showed some inconsistencies in the data by comparing quantitative data with the qualitative responses (Krawczyk et al., 2019). UX model (Topolewski et al., 2019) was used in the survey design to form a questionnaire.

Furthermore, quantification of the data may be beneficial for research that is dealing with qualitative data. For example, when the researcher wants to count the frequency of an appearing phenomenon. Frequencies may be displayed using a table summarizing the number of cases or diagrams. Quantified data may be viewed as supplementary to the qualitative data (Saunders et al. 2009, p. 497). Thus, this study would utilize mixed methods (utilizing quantitative and qualitative approaches) with some quantification of qualitative data as a means of providing more comprehensive findings and improving the validity and reliability of the research.

3.2. Data Collection

Groves et al. (2011, p. 33) state, in the form of a list of questions, that in the survey design, there are certain important decisions that a survey methodologist has to make regarding thousands of individual features of a survey. These questions by ibid. (2011, p. 33) are used as a basis for designing a survey for this study:

1 *"How will the potential sample members be identified and selected?*
2 *What approach will be taken to contact those sampled, and how much effort will be devoted to trying to collect data from those who are hard to reach or reluctant to respond?*
3 *How much effort will be devoted to evaluating and testing questions that are asked?*
4 *What mode will be used to pose questions and collect answers from respondents?*
5 *If interviewers are involved, how much effort will be devoted to training and supervising interviewers?*
6 *How much effort will be devoted to checking the data files for accuracy and internal consistency?*
7 *What approaches will be used to adjust the survey estimates to correct for errors that can be identified?"*

Convenience sampling – is a method to choose participants who are available and easy to find. The sample selection process is continued until a required sample size has been reached. Convenience sampling is potentially less inclined towards bias if the variation in the population is little (Saunders et al., 2009, p. 241). In contemporary research, the main advantage of this technique is that it is easy and is detrimental since a researcher is a single person, and the method of surveying

(qualitative) is a highly time-consuming occupation. Variation in the population of students may not be that high, although certain characteristics may influence the results, which are to be collected and presented for evaluating the reliability of the sample. Furthermore, convenience samples often serve as pilots to more structured studies (ibid., 2009, p. 241). This is an exploratory study, and future research may try to establish a better sampling technique based on the acquired results. Al-Gahtani et al. (2016), in the study of e-learning acceptance and assimilation, consider the convenience sampling technique as appropriate for researching the topic. Hwang and Salvendy (2010) state that for usability evaluation of software products, there should be 8 to 12 respondents at the minimum. As such, convenience sampling will be how potential sample members are identified and selected. In this research, 20 respondents will be surveyed, with 10 males and 10 females, so that it is possible to compare the answers between the two groups qualitatively.

As it was mentioned above, this is research that utilizes qualitative interviewing as its methodology. Participants are approached by the interviewer in person. Those who are reluctant to give answers would have to be ignored as the only possible option, although a data of total approaches to potential interviewees should be recorded so that it is possible to estimate a non-response bias by comparing it with the total number of interviews. According to Saunders et al. (2009), the subject of research ethics has the necessary implications for the negotiation of access to people and organizations and the collection of data. Authors state that the general ethical issue is that the research design should not subject those who are being researched to embarrassment, harm, or any other material disadvantage (Saunders et al., 2009, p. 160). In the beginning, survey participants were given an ability not to respond to any of the questions, as well as they were reassured that the responses would be anonymized in the research, and as such, it will be impossible to track back the results back to the respondent. This had several goals in mind. Firstly, it is an ethical stance of the research to allow respondents to control the information that they give and be reassured that the information will not harm respondents. Secondly, it could potentially raise the level of confidence among the respondents that they are safe to reveal the information and that they may feel comfortable during the survey. As a result, information is expected to be more accurate and provide deeper insights.

Questions for the interviews are based on the literature. Certain factors in the literature are considered to be influential in the use of e-learning. Maldonado et al. (2011) state that potential factors affecting e-learning are gender, age, and experience of use. Additionally, ibid. (2011) state, according to their literature research that they consider culture, race, family income, religion, political activities could impact the e-learning use. As such, ethnicity or nationality could broadly represent the socio-economical background. Al-Gahtani et al. (2016), in the research of e-learning acceptance, have included course major (e.g., Business or Engineering) and study level (e.g., Bachelor's or Master's). Bowker (2015) states that language of the website interface could potentially impact the UX, according to how translatable the original text into another language, preferred by the user. Holtbrügge and Mohr (2010) claim that exchange student status is related to the individuals' learning style preferences. Thus, it is proposed that different patterns of e-learning, and consequently – of Moodle UX – could emerge as a result of a difference in characteristics of students. As such, these are deemed to be useful to gather from

participants – least to outline the potential differences and validity of collected survey data.

Participants are given a survey where they are asked to reveal the information about themselves, which may be considered as a contextual factor impacting the results of the research. Respondents are asked to state their: Name or Respondent number/ID, Age, Gender, Ethnicity or Nationality, Length of using Moodle (and if used any other LMS), Language in which Moodle is mostly used (e.g., in English), whether a student is an exchange or a home (i.e., from Åbo Akademi University) student, and at what level of studies the student is currently studying (Bachelor's, Master's or other).

Both the quantitative survey and semi-structured questions utilize the same question format, and it's based on a holistic UX model by Pallot et al. (2014), which was adapted by Topolewski et al. (2019) to evaluate UX properties of a mobile feedback-collection app. Appendix 1 shows the survey questions and semi-structured questions. UX properties for this study were adapted from research by Topolewski et al. (2019), whereby 21 UX properties were tested on a dataset of 100 respondents answering 24 questions (together with 3 extra questions concerning the intention to use, as being formulated by the UX properties, facets and dimensions). Questions were also adapted based on a study by Krawczyk et al. (2019), which relies on the same dataset and where questions about UX properties are structured in an intelligible for a surveying manner (the questionnaire is accessed by the researcher as a co-author in both of the studies). Questions for this research were adapted because the UX properties were utilized in a different context of using a mobile application. After retrieving information about respondents, interviewees were given a survey to fill on a Likert scale from 1 to 7, where 1 is very unfulfilling UX property, and 7 is very fulfilling UX property. After respondents gave answers to the quantitative survey (Appendix 1) on a paper, the researcher has taken the role of an interviewer and proceeded to ask semi-structured questions that aimed at evaluating the same UX properties. In the process of interviewing, the researcher occasionally asked questions asking to verify, elaborate, or expand on the topic mentioned by the respondent to gain richer qualitative data. The interviews were audio-recorded for the consequent transcription. Transcription of the interviews is usually made after recording interviews – reproduced as a written (word-processed) account using the actual words (Saunders et al. 2009, p. 485).

The data was collected between 21.02.2020 and 10.03.2020 approximately between 10 AM and 6 PM on the premises of Åbo Akademi University in Turku, Finland. Respondent surveying was comprehended in a public space in two out of several university campuses: ASA or Arken. The area where the interviewing was taking place was different environment – sometimes noisy with many people passing by, occasionally silent with a few people nearby. Sometimes, other people were sitting nearby the participants, supposedly of their close social circle like study acquaintances, with a few times when these people commented on something but were asked not to intervene for the sake of not influencing the opinion of any given respondent, who was expected to give feedback on the individual UX. Oftentimes, however, respondents were alone when giving interviews. Approached respondents

on the campus were frequently busy doing some other activity, with the most reported reason for not giving an interview by those who rejected being survey that they do not have the time or that they have to focus on studying. Some of the respondents knew the interviewer before being approached with a request to survey them or potentially saw the researcher on the public premises. As such, the research context must be considered when evaluating the limitations because the context might have influenced the data in one or the other way.

After the stage of interviewing respondents began the process of transcribing the interviews from collected audio files to a word-processing tool MS Word. It was done by listening to the audios with recorded interviews and then typing in the text in MS Word under the codified names of the respondent's number and gender (F or M). Transcripts of the interviews were later analyzed with the computer-assisted qualitative analysis software tool (CAQDAS) called NVivo. Additionally, quantitative data from the questionnaires were filled into MS Excel, whereby it was consequently analyzed quantitatively.

Answering the fifth question of Groves et al. (2011, p. 33), the researcher, who is simultaneously bearing an interviewer role, has designed the survey and is relatively experienced with semi-structured interviews, and as such, shall be considered trained and adequately supervised. Consequently, data was verified by the interviewer by checking that the data is appropriately collected and recorded (such as there were no missing ticks in the questionnaire or no double-marks, which happened during the data collection stage a couple of times). In the process of interviewing, there were also occasional moments when the researcher asked the respondent to comment verbally on the supposed inconsistency in the quantitative score in the survey and the given qualitative comment, with the goal of at least outlining the potential limitations of the mixed methods. Finally, to evaluate the methodology's suitability for exploring the UX of LMS, the researcher sometimes asked to comment at the end of interviews whether it would have been easier for the respondent to understand questions (and thus answer more to the point of the question asked) if quantitative or qualitative data collection was before the other. A number of people who rejected being surveyed was recorded to estimate the non-response bias.

After the data collection, quantitative and qualitative data are consequently analyzed, where findings and results are drawn. The survey estimates would not be adjusted to correct for errors that can be identified, given that it is a qualitative-driven survey. Although, as it was mentioned, additional data (other than gender, which is at the core focus of this research) are collected from participants, which would help to establish potential sources of errors. As a result, it is expected that the contemporary qualitative-driven mixed methods approach to evaluating UX of LMS Moodle will help to answer the RQs and help address the gaps in the research literature.

3.3. Data Analysis

According to Saunders et al. (2009, p. 503-505), Miles and Huberman (1994) described three concurrent broad tasks for qualitative data analysis: data reduction,

data display, and conclusion drawing or verification. Data reduction is about summarizing and simplifying the data collected and selectively focusing on some parts of this data. The process of data reduction attempts to transform the data and to condense it. Lengthy, unreduced text in the form of interview transcripts are cumbersome because they are dispersed over many pages and are hard to comprehend. For this purpose of showing qualitative data in a clear manner, qualitative data display may be applied. Data display through visual formatting shows the information in a systematic way. Thus, it is possible to draw conclusions and take necessary actions to tackle the problem. There are two main families of data display: matrices and networks. Matrices are generally tabular in form, with defined columns and rows, where data are entered selectively into the appropriate cells of a matrix. A network is a collection of nodes or points connected by links or lines that display streams of participant actions, events, and processes. Networks may help to express complex interrelationships between variables (Saunders et al., 2009, p. 503-505.)

Jansen (2010) recognizes three levels of qualitative analysis: uni-dimensional description, multi-dimensional description, and explanatory analysis, developed in either in a concept-oriented or in a unit-oriented fashion. The first level of the qualitative analysis is a unidimensional description. In the unidimensional description, three logical levels of diversity have to be distinguished: objects, dimensions of objects (variables in statistical analysis), and categories of dimensions (values). The coding of a data fragment could be either downward (i.e., differentiating, establishing diversity within an object by distinguishing categories) or upward (i.e., synthesizing, specifying commonalities with other objects, dimensions, or categories). In the second-level analysis, multi-dimensional description is performed. The analysis could be case-oriented or dimension-oriented. Concept-oriented synthesis consists of compiling (explicitly or implicitly) a number of dimensions and/or categories into one abstract core concept, while case-oriented synthesis consists of grouping similar cases into types (categorical classes) (Jansen, 2010).

Third-level analysis in a qualitative survey is an explanation. In the statistical causal analysis, the aim is to explain (technically, not theoretically) gradual variation (variance) in the dependent variable (representing the object of study) based on independent variables by techniques like discriminant analysis, multiple regression analysis, and linear structural relations (LISREL) analysis. In a qualitative survey, one may analyze relationships between types (from the multidimensional description) and selected contextual conditions with a conditional matrix. In the qualitative analysis, the boundaries of multidimensional description and explanation overlap, and in the practice of searching for a maximal explanation, there is often an explorative iteration of descriptive and explanatory analysis (Jansen, 2010).

Saunders et al. (2009, p. 481) state that CAQDAS (Computer-Assisted Qualitative Data Analysis Software) may help with undertaking routine qualitative data management tasks manually, such as sorting data into categories and locating subsets of these data according to specified criteria. Ibid. (2009, p. 514) also mention that the use of CAQDAS offers several advantages – when used systematically, it can

aid continuity and increase both transparency and methodological rigor. In this research, CAQDAS NVivo 12.6 Pro was used at the stages of qualitative data reduction, data display, and when preparing conclusions of the research. CAQDAS was also used for some quantification of the data. MS Excel was used as a tool to prepare the data to be used in the CAQDAS by typing in the received responses in the respective data fields (such as the gender filled by the respondent in the survey was typed in the column gender in the MS Excel). Transcripts of the interviews were also typed in the MS Excel by copy-pasting the answers to semi-structured questions into the respective data fields in MS Excel. After such data preparation, the researcher has imported the data in CAQDAS – this allowed to have a more nuanced data analysis. For example, it allowed seeing how many respondents of a certain gender have mentioned a certain UX property in a semi-structured interview and what quantitative grading they gave for that UX property. However, Campbell et al. (2013, 308) mentioned that when performing qualitative analysis research requires, coding is not a substitute for deep and repeated immersion in the transcript data. Hence, the researcher has continually returned to the transcript data in the data analysis stage.

3.4. Summary of Methodology

The contemporary research is pragmatic, which means that the researcher is immersed in the context of the study and social reality, although the researcher makes attempts at abstracting oneself to some extent. The research is deductive, based on mixed methods, although some inductive analysis may take place to improve the validity of the research. Semi-structured interviewing was suggested by the literature to analyze the UX of an LMS. Additionally, quantitative surveying was found to be able to improve the capability for interpreting the qualitative data collected by the semi-structured interviews. Previous research of a holistic UX model was used as a basis for the qualitative and quantitative questionnaires. From the previous research, 21 UX properties and 3 attributes of intention to use of an LMS through giving a score on a Likert scale from 1 to 7 for the 24 questions were taken. The same questions were used both for quantitative surveying and semi-structured interviewing. Data were collected from 20 respondents – students of Åbo Akademi University – at two of the several campuses of the university. Each of the respondents was surveyed in three stages. The first stage asked to answer questions on the printed survey on the respondent's name, gender, age, ethnicity or nationality, the experience of using Moodle and other LMSs, the language of the UI of Moodle, whether informants were home or coming from abroad, study level and study major. The second stage asked to fill in a quantitative survey on the other side of the printed paper. The third stage included the respondents answering the researcher's semi-structured questions in an interview. The researcher occasionally explained the semi-structured questions or asked additional questions to elaborate on the respondents' answers. The questionnaire for the first and second stages may be found in Appendix 1. Interviews were audio-recorded and then transcribed. Consequently, data were analyzed in NVivo, MS Excel, and R studio. NVivo facilitated the analysis of the qualitative data and quantification of qualitative data. MS Excel was used to analyze quantitative and quantified data. R studio was used to perform Hierarchical Clustering Analysis.

4 Results

In this section, the results of the study are presented. Firstly, the demographics of the respondents are described, which come from data collection. After that, the analysis of the collected data is performed. Data analysis starts with quantitative analysis – descriptive statistics, Mann-Whitney U test, and hierarchical clustering analysis. Consequently, the central part of the data analysis – qualitative analysis and data quantification – is performed. Verification of the results attempts to evaluate the validity and reliability of the results. Finally, data analysis results are presented, which is a summary of the performed data analysis in the previous parts.

4.1. Respondents

In total, 20 respondents were interviewed, out of which 10 were male, and 10 were female. There were 8 people who have rejected interviewing, usually by justifying their response with the lack of time for an interview, hence the response rate is 71.14%. As mentioned above in the data collection, other than collecting the responses of quantitative and qualitative evaluations, additional self-reported data were collected from respondents about them. Table 4 shows the collected dataset of the respondents' self-reported attributes.

Table 4. Collected data about interviews and respondents.

#	Date	Age	Gender	Nationality	Exp. Use (Moodle, years)	Exp. Use (Other, years)	Exp. Use (Total, years)	UI language	Exchange Student	Study level	Study Major	Semi-structured Interview Time (Min.)
1	21-02-20	24	Female	Finnish	5	0.5	5.5	Swedish	No	Master's	Psychology	14
2	21-02-20	27	Female	Finnish	6.5	0.5	7	Swedish	No	Master's	Art History	22.5
3	21-02-20	22	Male	Finnish	3	0	3	Swedish / Finnish	No	Bachelor's	Economics	38.5
4	24-02-20	NN	Female	Russian	1	4	5	English / Finnish	No	Master's	Governance of Digitalization	53
5	24-02-20	22	Female	Kazakh	4.5	0	4.5	English	No	Master's	Governance of Digitalization	22
6	26-02-20	21	Female	Finnish	2.5	0.5	3	Swedish	No	Bachelor's	Psychology	17
7	26-02-20	22	Female	Finnish	0.5	0	0.5	Swedish	No	Bachelor's	Philosophy	32
8	26-02-20	22	Male	Finnish	4	1.5	5.5	Swedish	No	Bachelor's	Chem. Engineering	16.5
9	28-02-20	22	Female	Finnish	4	0	4	Swedish	No	Bachelor's	Envir. & Marine Biology	39.5
10	02-03-20	31	Male	Finnish	4.5	0	4.5	Swedish	No	Bachelor's	Social Sciences	23
11	02-03-20	26	Male	Finnish	5	0.5	5.5	Swedish	No	Master's	Philosophy	20
12	03-03-20	23	Female	Finnish	4	6	10	Swedish	No	Bachelor's	International Marketing	24.5
13	04-03-20	25	Male	Finnish	6	0.5	6.5	Swedish	No	Master's	Economics	27
14	04-03-20	21	Male	Finnish	3	3	6	Swedish	No	Bachelor's	International Marketing	24
15	04-03-20	22	Male	Finnish	1	0	1	Swedish	No	Bachelor's	Business	18
16	06-03-20	23	Male	Finnish	4	3	7	Swedish	No	Master's	Business	21
17	06-03-20	26	Male	Finnish	7	0	7	Swedish	No	Master's	Int. Law & Human Rights	33.5
18	10-03-20	24	Male	Italian	0.25	4	4.25	English	Yes	Master's	Management/Business	19
19	10-03-20	21	Female	Finnish	2	0	2	Swedish	No	Bachelor's	Philosophy	22
20	10-03-20	20	Female	Finnish	2	3	5	Swedish	No	Bachelor's	Finnish language	14.5

The average age was 23.4, whereas the median age was 22, ranging between 20 and 31 years. One female respondent chose not to reveal her age. There were 17 respondents with a Finnish, 1 Russian, 1 Kazakh, and 1 Italian nationality. Those who reported being Finns, also mentioned that they used Moodle in Swedish (with the exception of one male Finn, who may have used in Swedish or in Finnish). A Russian female stated she used Moodle in English or Finnish, whereas Kazakh and Italian students stated they used Moodle in English. With the exception of an Italian student, all the other 19 respondents were from Åbo Akademi University.

Eleven respondents were studying at a bachelor's level. Nine students were studying at a master's level. There are 4 female master's students, 6 female

bachelor's students, 5 male master's students, and 5 male bachelor's students. Academic majors of the respondents varied significantly: 1 student was studying Art History, 3 students studied Business, 1 student studied chemical engineering, 2 students studied Economics, 1 student studied environment and marine biology, 2 students studied the Finnish language, 2 students studied Governance of Digitalization, 1 student studied international law and human rights, 2 students studied international marketing, 3 students studied philosophy, 2 students studied psychology, 1 student studied social sciences.

Respondents also reported that they were somewhat experienced with the use of the learning management system. The average use of Moodle was 3.5 years, with a median usage of 4 years, ranging between three months and 7 years. Some students also had experience using other similar to Moodle LMSs (such as Wilma in the high school in Finland or LMS used in other universities during the study exchange): average use of other LMSs was 1.35 years, with a median use of 6 months. Importantly, not all of the students have used any other LMS – just 12 students used other LMS, ranging in experience from 6 months to 6 years. In total, the average use of combined LMSs was 4.83 years, whereas the median use of LMSs was 5 years.

Finally, recorded semi-structured interviewing had an average length of 25 minutes, whereas the median interview length was 22.25 minutes. Interviews lasted between 14 and 53 minutes. In addition to this time, for each respondent, about 3 to 5 minutes were devoted to filling out a printed-out survey and communicating the purpose of the research, as well as answering arising questions. Table 5 below shows the collected data on the quantitative evaluations of UX properties on a Likert scale from 1 to 7, which is analyzed in the following sections of the thesis.

Table 5. Quantitative survey data results measuring UX properties.

Resp. #	1 - Usefulness	2 - Pleasantness	3 - Entertaining	4 - Productivity	5 - Novelty	6 - Reliability	7 - Efficiency	8 - User-friendliness	9 - Attractiveness	10 - Enjoyment	11 - Fulfillness	12 - Comprehensiveness	13 - Meaningfulness	14 - Engagement	15 - Communicativeness	16 - Collaborativeness	17 - Confidence	18 - Attentiveness	19 - Responsiveness	20 - Helpfulness	21 - Respectfulness	22 - Convincingness	23 - Willingness	24 - Recommend
1	7	7	4	7	1	7	7	7	5	7	7	7	7	7	7	6	5	5	4	7	7	7	7	7
2	7	5	2	6	5	4	5	6	4	5	7	6	6	7	5	3	6	5	4	6	7	4	6	6
3	6	6	4	6	4	4	6	4	4	4	4	4	5	4	2	3	4	4	3	2	4	6	5	4
4	7	7	4	5	1	7	6	7	7	7	6	7	7	6	7	7	7	7	7	7	7	7	1	7
5	7	6	6	7	1	5	7	5	6	6	6	4	4	6	5	4	5	6	7	6	7	7	4	6
6	3	3	1	4	1	5	4	2	2	1	4	3	4	2	2	2	3	3	4	4	5	3	4	1
7	6	6	4	5	4	7	6	4	4	5	6	5	7	6	5	4	6	6	6	5	7	7	7	7
8	6	5	3	6	4	7	6	7	4	4	6	4	6	4	5	5	7	6	6	5	7	7	7	7
9	7	5	3	5	1	6	6	4	2	5	6	3	7	6	3	3	6	5	5	6	6	7	5	6
10	7	5	4	6	6	6	6	4	3	5	6	6	7	6	5	6	5	5	5	6	5	7	7	6
11	4	5	4	6	1	6	4	3	2	4	4	3	4	3	5	5	4	5	6	4	6	5	5	4
12	6	3	2	5	6	6	6	4	2	2	4	5	5	5	3	3	6	5	3	3	5	6	4	5
13	6	4	2	5	4	6	5	3	2	3	6	5	6	7	2	4	2	3	6	2	4	6	6	6
14	6	4	3	5	3	6	6	3	2	4	5	5	6	4	5	3	6	4	6	6	6	7	6	5
15	6	4	4	6	5	6	5	4	3	5	5	4	6	6	6	4	5	4	5	3	4	6	7	6
16	6	6	4	5	4	5	4	4	4	3	4	3	6	7	2	3	5	4	3	3	4	5	6	6
17	5	6	4	6	5	6	6	6	4	6	6	6	6	5	5	3	5	5	6	5	6	6	6	6
18	7	6	5	6	5	5	5	6	5	5	6	6	6	5	5	6	6	5	4	5	5	5	6	6
19	6	5	4	5	4	5	6	6	3	4	4	3	3	4	3	3	5	5	5	5	6	7	6	6
20	5	4	3	5	5	4	5	4	3	2	3	4	5	4	4	3	3	3	3	5	3	6	6	6

4.2. Analysis of the Collected Data

Quantitative Analysis

Firstly, descriptive statistics of the quantitative data is analyzed across given UX scores. Mann-Whitney U test is applied to test the difference in the median between

the two populations of gender. Finally, hierarchical clustering analysis is performed to establish clusters of the respondents based on the UX property scores.

Descriptive Statistics and Mann-Whitney U test of populations

Descriptive statistics of quantitative responses are given in three tables (Tables 6, 7 and 8): one for two genders combined and then two tables for each of the genders.

Table 6. Descriptive statistics of the quantitative responses of the two genders.

UX Dimension	UX Facet	UX Property	Mean	Standard Deviation	Median	Min	Max
Business	Economical	Usefulness	6	1.08	6	3	7
		Pleasantness	5.1	1.17	5	3	7
		Entertaining	3.5	1.15	4	1	6
		Productivity	5.55	0.76	5.5	4	7
	Technological	Novelty	3.5	1.82	4	1	6
		Reliability	5.65	0.99	6	4	7
		Efficiency	5.55	0.89	6	4	7
		User-friendliness	4.65	1.50	4	2	7
Human	Emotional	Attractiveness	3.55	1.43	3.5	2	7
		Enjoyment	4.35	1.60	4.5	1	7
		Fulfilness	5.25	1.16	6	3	7
	Cognitive	Comprehensiveness	4.65	1.35	4.5	3	7
		Meaningfulness	5.65	1.18	6	3	7
		Engagement	5.2	1.44	5.5	2	7
Social	Interpersonal	Communicativeness	4.3	1.59	5	2	7
		Collaborativeness	4	1.38	3.5	2	7
		Confidence	5.05	1.32	5	2	7
	Empathical	Attentiveness	4.75	1.07	5	3	7
		Responsiveness	4.9	1.33	5	3	7
		Helpfulness	4.75	1.52	5	2	7
		Respectfulness	5.55	1.28	6	3	7
	Intention to use	Convincingness	6.05	1.15	6	3	7
		Willingness	5.55	1.47	6	1	7
		Recommend	5.65	1.39	6	1	7

According to the descriptive statistics, it may be said that there are certain attributes that are considered as relatively good according to the means (scores over 5): usefulness, pleasantness, productivity, reliability, efficiency, fulfilness, meaningfulness, engagement, confidence, respectfulness, as well as highly reported intentions to use. Some elements are close to being mildly good to acceptable according to the means (scores between 4 and 5): user-friendliness, enjoyment, comprehensiveness, communicativeness, collaborativeness, attentiveness, responsiveness, helpfulness. At the same time, descriptive statistics show that there are some mildly low-rated elements according to the means (scores less than 4): entertaining, novelty, attractiveness. Standard deviation, a measure of how much variability there are in quantitative scores, shows that standard deviation for most of the UX properties and intention to use is between 0.75 and 1.8 – some elements having higher variability (e.g., Novelty) than others (e.g., Productivity). There are

also descriptive statistics for each of the genders, which are represented in the two tables below.

Table 7. Descriptive statistics of the quantitative responses of females.

UX Dimension	UX Facet	UX Property	Mean	Standard Deviation	Median	Min	Max
Business	Economical	Usefulness	6.1	1.29	6.5	3	7
		Pleasantness	5.1	1.45	5	3	7
		Entertaining	3.3	1.42	3.5	1	6
		Productivity	5.4	0.97	5	4	7
	Technological	Novelty	2.9	2.08	2.5	1	6
		Reliability	5.6	1.17	5.5	4	7
		Efficiency	5.8	0.92	6	4	7
		User-friendliness	4.9	1.60	4.5	2	7
Human	Emotional	Attractiveness	3.8	1.75	3.5	2	7
		Enjoyment	4.4	2.12	5	1	7
		Fulfilness	5.3	1.42	6	3	7
	Cognitive	Comprehensiveness	4.7	1.57	4.5	3	7
		Meaningfulness	5.5	1.51	5.5	3	7
		Engagement	5.3	1.57	6	2	7
Social	Interpersonal	Communicativeness	4.4	1.71	4.5	2	7
		Collaborativeness	3.8	1.55	3	2	7
		Confidence	5.2	1.32	5.5	3	7
	Empathical	Attentiveness	5	1.25	5	3	7
		Responsiveness	4.8	1.48	4.5	3	7
		Helpfulness	5.4	1.26	5.5	3	7
		Respectfulness	6	1.33	6.5	3	7
	Intention to use	Convincingness	6.1	1.45	7	3	7
		Willingness	5	1.83	5.5	1	7
		Recommend	5.7	1.77	6	1	7

For the females, according to the descriptive statistics, it may be said that there are certain attributes that are considered as relatively good according to the means (scores over 5): usefulness, pleasantness, productivity, reliability, efficiency, fulfilness, meaningfulness, engagement, confidence, attentiveness, helpfulness, respectfulness, as well as highly reported intentions to use. Some elements are close to being mildly good to acceptable according to the means (scores between 4 and 5): user-friendliness, enjoyment, comprehensiveness, communicativeness, responsiveness. At the same time, descriptive statistics show that there are some mildly low-rated elements according to the means (scores less than 4): entertaining, novelty, attractiveness, collaborativeness. Standard deviation, a measure of how much variability there are in quantitative scores, shows that standard deviation for most of the UX properties and intention to use is between 0.9 and 2.07 – some elements having higher variability (e.g., Novelty) than others (e.g., Productivity).

Table 8. Descriptive statistics of the quantitative responses of males.

UX Dimension	UX Facet	UX Property	Mean	Standard Deviation	Median	Min	Max
Business	Economical	Usefulness	5.9	0.88	6	4	7
		Pleasantness	5.1	0.88	5	4	6
		Entertaining	3.7	0.82	4	2	5
		Productivity	5.7	0.48	6	5	6
	Technological	Novelty	4.1	1.37	4	1	6
		Reliability	5.7	0.82	6	4	7
		Efficiency	5.3	0.82	5.5	4	6
		User-friendliness	4.4	1.43	4	3	7
Human	Emotional	Attractiveness	3.3	1.06	3.5	2	5
		Enjoyment	4.3	0.95	4	3	6
		Fulfilness	5.2	0.92	5.5	4	6
	Cognitive	Comprehensiveness	4.6	1.17	4.5	3	6
		Meaningfulness	5.8	0.79	6	4	7
		Engagement	5.1	1.37	5	3	7
Social	Interpersonal	Communicativeness	4.2	1.55	5	2	6
		Collaborativeness	4.2	1.23	4	3	6
		Confidence	4.9	1.37	5	2	7
	Empathical	Attentiveness	4.5	0.85	4.5	3	6
		Responsiveness	5	1.25	5.5	3	6
		Helpfulness	4.1	1.52	4.5	2	6
		Respectfulness	5.1	1.10	5	4	7
	Intention to use	Convincingness	6	0.82	6	5	7
		Willingness	6.1	0.74	6	5	7
		Recommend	5.6	0.97	6	4	7

For the males, according to the descriptive statistics, it may be said that there are certain attributes that are considered as relatively good according to the means (scores over 5): usefulness, pleasantness, productivity, reliability, efficiency, fulfilness, meaningfulness, engagement, responsiveness, respectfulness, as well as highly reported intentions to use. Some elements are close to being mildly good to acceptable according to the means (scores between 4 and 5): novelty, user-friendliness, enjoyment, comprehensiveness, communicativeness, collaborativeness, confidence, attentiveness, helpfulness. At the same time, descriptive statistics show that there are some mildly low-rated elements according to the means (scores less than 4): entertaining, attractiveness. Standard deviation, a measure of how much variability there are in quantitative scores, shows that standard deviation for most of the UX properties and intention to use is between 0.9 and 2.07 – some elements having higher variability (e.g., Novelty) than others (e.g., Productivity). However, this is a general picture for both genders, with some differences occurring between the genders, which is shown below.

Table 9. Differences in means, medians, and standard deviations in quantitative responses between the two genders (scorings of males are subtracted from scorings of females).

UX Dimension	UX Facet	UX Property	Difference in Means (Female - Male)	Difference in Standard Deviation (Female - Male)	Difference in Medians (Female - Male)	U-value	p-value	Decision on the null hypothesis (alpha = 0.05)	Decision on the null hypothesis (alpha = 0.1)
Business	Economical	Usefulness	0.2	0.41	0.5	38.5	0.41	Don't Reject	Don't Reject
		Pleasantness	0	0.57	0	49	0.97	Don't Reject	Don't Reject
		Entertaining	-0.4	0.59	-0.5	39	0.43	Don't Reject	Don't Reject
		Productivity	-0.3	0.48	-1	35.5	0.29	Don't Reject	Don't Reject
	Technological	Novelty	-1.2	0.71	-1.5	35	0.27	Don't Reject	Don't Reject
		Reliability	-0.1	0.35	-0.5	47.5	0.88	Don't Reject	Don't Reject
		Efficiency	0.5	0.10	0.5	34.5	0.26	Don't Reject	Don't Reject
		User-friendliness	0.5	0.17	0.5	38	0.38	Don't Reject	Don't Reject
Human	Emotional	Attractiveness	0.5	0.69	0	44	0.68	Don't Reject	Don't Reject
		Enjoyment	0.1	1.17	1	44	0.68	Don't Reject	Don't Reject
		Fulfilness	0.1	0.50	0.5	45.5	0.76	Don't Reject	Don't Reject
	Cognitive	Comprehensiveness	0.1	0.39	0	49.5	1.00	Don't Reject	Don't Reject
		Meaningfulness	-0.3	0.72	-0.5	47.5	0.88	Don't Reject	Don't Reject
		Engagement	0.2	0.20	1	44	0.68	Don't Reject	Don't Reject
Social	Interpersonal	Communicativeness	0.2	0.16	-0.5	48.5	0.94	Don't Reject	Don't Reject
		Collaborativeness	-0.4	0.32	-1	39	0.43	Don't Reject	Don't Reject
		Confidence	0.3	-0.05	0.5	41.5	0.55	Don't Reject	Don't Reject
	Empathical	Attentiveness	0.5	0.40	0.5	35	0.27	Don't Reject	Don't Reject
		Responsiveness	-0.2	0.23	-1	45	0.73	Don't Reject	Don't Reject
		Helpfulness	1.3	-0.26	1	26	0.08	Don't Reject	Reject
		Respectfulness	0.9	0.23	1.5	27.5	0.096	Don't Reject	Reject
	Intention to use	Convincingness	0.1	0.63	1	39	0.43	Don't Reject	Don't Reject
		Willingness	-1.1	1.09	-0.5	31.5	0.17	Don't Reject	Don't Reject
		Recommend	0.1	0.80	0	39	0.43	Don't Reject	Don't Reject

It may be seen that there are certain differences in how the two genders evaluate the UX properties of Moodle quantitatively. The table in Table 9 shows the difference by subtracting the mean, standard deviation, and median score of the male group from the female group (i.e., if the number is positive, it means that the female's variable is higher than male's). The Colour scheme is applied to represent UX properties that are most deviant from each other. It is seen that some UX properties are not different or little different across the two genders, based on means (scores of +/- 0 to 0.2): usefulness, pleasantness, reliability, enjoyment, fulfilness, comprehensiveness, engagement, communicativeness, responsiveness, convincingness and recommend. There are some UX properties that are mildly different based on means (scores of +/- 0.3 to 0.5): entertaining, productivity, efficiency, user-friendliness, meaningfulness, collaborativeness, confidence, attentiveness. There are also a few UX properties, which are seemingly different for the two genders based on means (scores of +/- 0.9 to 1.3): novelty, helpfulness, respectfulness, willingness. Simultaneously, females tend to be more variant in how they give their quantitative responses, according to having generally higher standard deviation for the scores.

Milenovic (2011) states that the Mann-Whitney U test is a non-parametric statistical technique used to compare the difference between medians of the two data sets of values on an ordinal or continuous scale, which is used instead of t-test when the normality of the sample distribution is not available. The null hypothesis in the Mann-Whitney U test is that the medians of the two populations are equal. If the null hypothesis is rejected, then the alternative hypothesis is that the medians of the two populations are not equal. As such, at the level of confidence (i.e., alpha) is equal to 0.05 (5%), none of the medians for any of the UX property is significantly different between the genders. If the level of confidence (i.e., alpha) is equal to 0.1 (10%), then only the medians in Helpfulness and Respectfulness are different (i.e., females ranking these higher than males). Applying the Mann-Whitney U test similarly to test whether the medians of the standard deviations of the UX properties are equal for males and females, one would get a very small p-value of 0.000017. Hence, the

medians of the standard deviations of mean scores of UX properties across two genders differed, showing that women are more variable in how they evaluate UX than men.

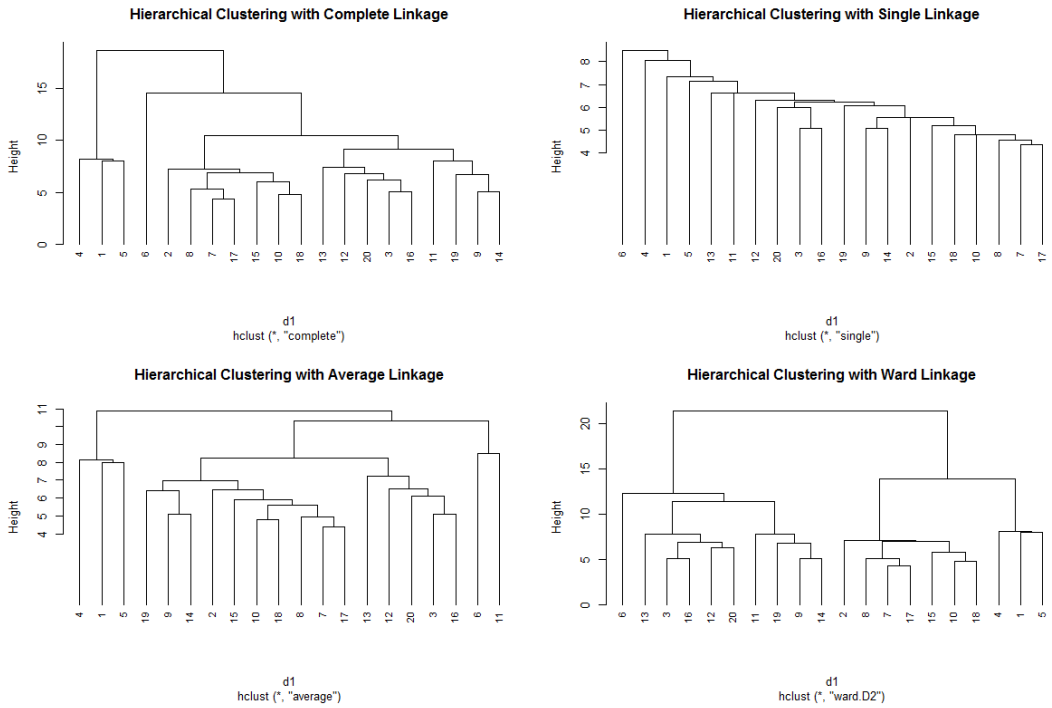
Hierarchical Clustering Analysis

Zhang et al. (2008) state that cluster analysis is used for clustering a dataset into groups of similar individuals. Additionally, cluster analysis is unsupervised learning and among the major techniques in pattern recognition. Jain (2010) states that clustering algorithms can be broadly classified into two groups: hierarchical and partitional. Celebi et al. (2013) state that K-means is the most widely used partitional clustering algorithm. Tu et al. (2012, p. 641) state that hierarchical clustering analysis is a widely used clustering technique, which can be divided into two categories: agglomerative methods, which proceed by making a series of merges of the *n* objects into more general groups, and divisive methods, which separate *n* objects successively into finer groups. Celebi et al. (2013) conclude that there are different advantages and disadvantages to both methods, and as such – different situations when hierarchical and partitional clustering analysis could be used.

A hierarchical clustering analysis was performed on the collected data in the R studio. Hierarchical clustering was preferred over the K means method due to the exploratory approach when analyzing UX. In the hierarchical clustering, one does not necessarily need to have an idea regarding the number of clusters, in this case, represented by the general lack of understanding of how many groups of users there are with similar UX properties. In a small sample study, the hierarchical approach may facilitate visualization and verification of the data through dendrograms, which is preferred over the K means approach.

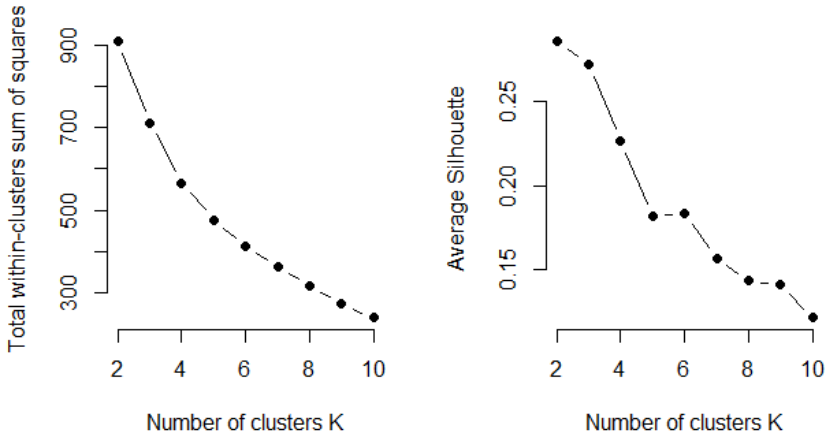
Quantitative scores of UX properties across 24 attributes given by 20 respondents were used to categorize respondents in the clusters. Additional data about respondents was not utilized in the analysis (i.e., the data was filtered for the respondent ID and quantitative score of UX properties and intention to use). Hierarchical Clustering Methods with Complete, Single, Average, and Ward Linkage were compared with each other to select the best method by comparing Height on the y-axis, shown in Figure 17 below. The clustering method whereby the difference between clusters was highest represented by the Height on the y-axis (i.e., the vertical line between clusters of pairs is tall), while the difference inside the clusters was minimal (i.e., the vertical line inside clusters of pairs is short) was chosen. Complete or Ward linkage were both satisfying that condition. Agglomerative hierarchical clustering with ward linkage was chosen.

Figure 17. Comparison of Hierarchical Clustering Linkage Methods.



Next, the optimal number of clusters (k) was chosen by applying the two methods simultaneously: Total Within-clusters sum of squares (WSS) and Average Silhouette. In the former, the rule states that such a k must be chosen, after which there is a slight decrease in a marginal decrease in WSS score, in other words, finding its "elbow" in the chart (Hansen et al., 1998). Average Silhouette rule for choosing k states that such a k must be chosen, which has the highest Average Silhouette score on the y-axis (Arsan and Hameez, 2019). Both methods could be used together to select the most optimal k, by trying to select such a k, which compromisingly satisfies both rules (Figure 18). As a result, the number of clusters 4 is chosen.

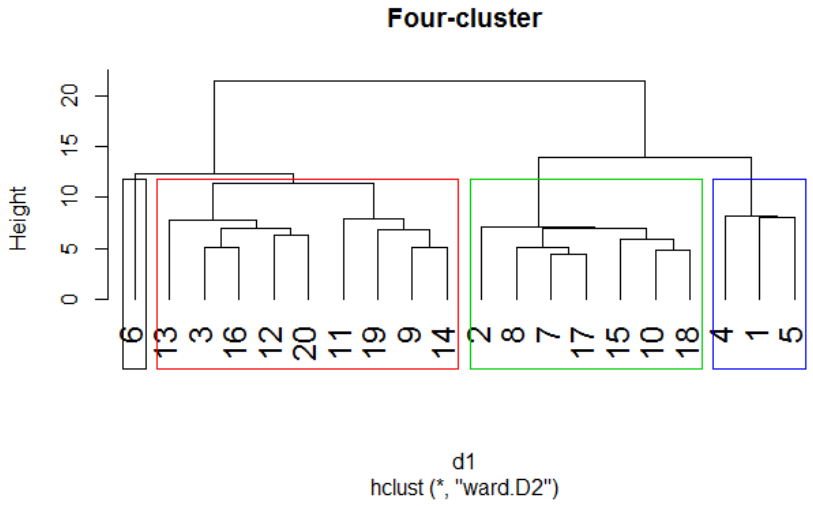
Figure 18. Comparison of WSS and Average Silhouette scores.



As a result, Hierarchical Clustering with Ward Linkage with four clusters is performed on the dataset. Figure 19 below shows the resulting clustering analysis in the form of the dendrogram, with a number at the base of the "tree" representing

the respondent number. Clusters suggested by the WSS and Average Silhouette methods roughly correspond to the clusters shown in the dendrogram.

Figure 19. Hierarchical Clustering with Ward Linkage with four clusters outlined.



After the clustering, cluster numbers were assigned to each of the respondents in the table. After the assignment of the cluster (k) to each of the respondent, averages were calculated to see the average of the attributes of the respondents (age, gender, study major, the experience of use, interview time) and the UX properties reported by the respondents in the same cluster. Tables 10 and 11 below show the results of calculating the averages, with a colour scheme applied to the UX properties for better visualization.

Table 10. Demographical data across the four clusters.

Cluster (k)	Cases (n)	Average Age	Males (%)	Females (%)	Bachelors (%)	Masters (%)	Avg. Total Exp. Of Use (years)	Avg. Interview Time (Min.)
1	3	23.0	0%	100%	0%	100%	5.0	29.7
2	7	24.9	71%	29%	57%	43%	4.3	23.5
3	9	22.6	56%	44%	75%	25%	5.4	25.7
4	1	21.0	0%	100%	100%	0%	3.0	17.0

Table 11. Mean UX property scores across the four clusters.

Cluster (k)	1 - Usefulness	2 - Pleasantness	3 - Entertaining	4 - Productivity	5 - Novelty	6 - Reliability	7 - Efficiency	8 - User-friendliness	9 - Attractiveness	10 - Enjoyment	11 - Fulfillness	12 - Comprehensiveness	13 - Meaningfulness	14 - Engagement	15 - Communicativeness	16 - Collaborativeness	17 - Confidence	18 - Attentiveness	19 - Responsiveness	20 - Helpfulness	21 - Respectfulness	22 - Convincingness	23 - Willingness	24 - Recommend	Avg. UX score across 24 elements
1	7.0	6.7	4.7	6.3	1.0	6.3	6.7	6.3	6.0	6.7	6.3	6.0	6.0	6.3	6.3	5.7	5.7	6.0	6.0	6.7	7.0	7.0	4.0	6.7	6.0
2	6.3	5.3	3.7	5.9	4.9	5.9	5.6	5.3	3.9	5.0	6.0	5.3	6.3	5.6	5.1	4.4	5.7	5.1	5.1	5.0	5.9	6.0	6.6	6.3	5.4
3	5.8	4.7	3.2	5.2	3.6	5.3	5.3	3.9	2.7	3.4	4.4	3.9	5.2	4.9	3.2	3.3	4.6	4.2	4.4	4.0	4.9	6.1	5.4	5.3	4.5
4	3.0	3.0	1.0	4.0	1.0	5.0	4.0	2.0	2.0	1.0	4.0	3.0	4.0	2.0	2.0	2.0	3.0	3.0	4.0	4.0	5.0	3.0	4.0	1.0	2.9

There are 3 respondents in cluster 1, 7 respondents in cluster 2, 9 respondents in cluster 3, and just one respondent in cluster 4. As one could observe, the four resulting clusters differ from each other, with diminishing overall scores for all of the UX properties. There are only 5 UX properties where clusters do not have a gradually diminishing average UX property score: Novelty, Meaningfulness,

Confidence, Convincingness, Willingness. However, even in these UX properties, clusters tend to have only a minor difference or with a small change of order (e.g., in Novelty – clusters 2, 3, and 4 are still having diminishing scores for that UX property, while only cluster 1 is not following the logic). Masters are increasingly more placed in the clusters that value Moodle more (k=1,2,3), than Bachelors, who are proportionately more placed in the clusters that value UX less (k=2,3,4). Gender-wise, clusters 1 and 4 are 100% female. Cluster 2 is mostly male (71%), while cluster 3 is approximately even in terms of gender.

Qualitative analysis and data quantification

Quantitative evaluations may give some general overview of how students and two different genders view the UX of using Moodle. However, the picture given by quantitative evaluations of the respondents is considered in the supportive role and should be viewed together with qualitative analysis. In the following part, the data analysis of semi-structured interviews is presented under 24 separate elements, representing UX properties and the intention to use.

Due to the mixed methods utilized in this study, each of the themes mentioned by the respondents when answering a semi-structured question was coded in the CAQDAS, and the number of respondents mentioning each of the topic or theme was quantified. The name of the mentioned topic is a shortened code of the topic that is explained below in the text to each of the UX property. The total number of the respondents, as well as the number of respondents for each gender for each topic, is calculated separately (Num. of resp. in the tables). Distribution of the number of people simultaneously ranking the UX property in the quantitative survey for each of the mentioned topics is given for each of the genders. For example, in the 1 – Usefulness, 3 females have rated Usefulness as 6, when stating that Usefulness depends on the teacher, whereas 1 male has rated Usefulness as 5 and another as 6.

Total mean score, as well as for each of the gender, is calculated for each of the mentioned topics separately, based on the previously mentioned distribution of quantitative scores. Finally, the difference in the number of respondents and in mean scores of the mentioned topic is calculated by subtracting the value for a male group from the respective value for the female group. For example, in 1 – Usefulness, one more female mentioned the topic that Usefulness comes from an overview of the course, with 1.5 higher mean scores for females mentioning the same topic than males. If the mean score difference cannot be calculated, then the field is left blank. A colouring scheme is applied to the values in the tables so that they are easier to read visually. Each of the tables is commented in the text below. The tables with quantified data are provided so that the reader can get a broader picture of the qualitative results. However, the reader might skip them as these are quite technical, with the summaries below the tables being the core message. Numbers in the brackets are sometimes used near the statements, and these represent the number of references of that statement. For example, *"Moodle helped to increase grades because of being an easy place to access information (3),"* means that three respondents mentioned that.

1 – Usefulness

Table 12. Quantified data of mentioned topics by respondents for question 1.

	1 - Usefulness																						
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male									
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Depends on the teacher	5	1	5.8		0	0	0	0	0	3	0	6.0	3	0	0	0	0	1	1	0		2
Easy to use	3	-1	6.3		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	1	1		2
e-learning courses	2	2	6.5		0	0	0	0	0	1	1		2	0	0	0	0	0	0	0		0
Fast_Slow_Work	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Few professors	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Group Work	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Helps to understand teacher	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Improve	2	0	5.0		0	0	0	0	0	1	0		1	0	0	0	1	0	0	0	4.0	1
Overview of the course	5	1	6.4	1.5	0	0	0	0	0	0	3	7.0	3	0	0	0	0	1	1	0	5.5	2
Send tasks_files	3	-1	5.3	-3.5	0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	1	1	6.5	2
Tasks_Assignments	5	-3	6.4		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	3	1		4
1 Evaluation	17	1	5.9	0.3	0	0	1	0	1	3	4	6.0	9	0	0	0	1	1	5	1	5.8	8
1 Neutral	3	1	4.3	0.5	0	0	1	0	0	1	0	4.5	2	0	0	0	1	0	0	0	4.0	1
1 Not useful	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
1 Useful	13	-1	6.3	0.7	0	0	0	0	0	2	4	6.7	6	0	0	0	0	1	5	1	6.0	7
Total (unique)	19	1	6.0	0.2	0	0	1	0	1	3	5	6.1	10	0	0	0	1	1	5	2	5.9	9

Respondents tend to mention that Moodle is a useful or somewhat useful platform for learning. 5 mentioned that the usefulness of the Moodle depends on the teacher. 5 respondents also stated that Moodle is useful because it provides an overview of the course together with all relevant to the course information provided by the teacher. 5 mentioned that Moodle helps with doing the tasks and assignments, such as 3 respondents who mentioned that in Moodle, it is easy to send assignments and tasks. 3 said that Moodle is useful because it is easy to use. 2 students outlined that there are many e-learning courses, which are easy to access in Moodle. One student stated that there are a few professors in her major, and hence Moodle is easy for these teachers to provide teaching. One mentioned that Moodle helps to understand the teacher. Simultaneously, other students state that Moodle is not particularly useful. One student mentioned that Moodle could be slow, such as loading documents in a browser window, which could be improved. Another stated that group works are not thought through, and hence could be improved in Moodle by implementing some sort of a feature for group work.

2 – Pleasantness

Table 13. Quantified data of mentioned topics by respondents for question 2.

Mentioned Topic	2 - Pleasantness																							
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male										
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Used to using Moodle	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
Not for pleasure but for work	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Limited use	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Layout_Design	5	-1	4.8		0	0	1	0	1	0	0		2	0	0	0	1	0	2	0	5.3	3
Easy_Hard to navigate_use	11	-1	5.0	-0.4	0	0	1	1	1	2	0	4.8	5	0	0	0	2	1	3	0	5.2	6
Depends on the teacher	3	-1	5.3	-0.5	0	0	0	0	1	0	0	5.0	1	0	0	0	0	1	1	0	5.5	2
Customizeable	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Improve	3	-3	5.3		0	0	0	0	0	0	0		0	0	0	0	1	0	2	0	5.3	3
2 Evaluation	17	1	5.1	0.1	0	0	2	1	2	2	2	5.1	9	0	0	0	3	2	3	0	5.0	8
2 Neutral	4	0	4.3	-0.5	0	0	1	0	1	0	0	4.0	2	0	0	0	1	1	0	0	4.5	2
2 Not pleasant	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
2 Pleasant	12	0	5.5	0.7	0	0	0	1	1	2	2	5.8	6	0	0	0	2	1	3	0	5.2	6
Total (unique)	20	0	5.1	0.0	0	0	2	1	3	2	2	5.1	10	0	0	0	3	3	4	0	5.1	10

11 respondents expressed something concerning the easiness of navigating and using Moodle. The majority of these responded that it is an easy platform in that sense. Some stated that it is a hard platform to navigate and use, or that it is hard in the beginning, but then it gets easier over the experience of use. 5 students expressed that they consider Moodle as a pleasant platform, whereas two found it neutral, and one stated that it is not a pleasant platform for the most part. Three students stated that pleasantness depends on the teacher – how he or she structures the course and the content. One respondent mentioned that Moodle is of limited use, with just sending assignments, and another stated that Moodle is for work, and hence does not have to be pleasant. Another student stated that the most pleasant thing in Moodle is that she is used to using it. There were several suggestions for improving Moodle in that regard – making Moodle simpler to use, making it easier to find new courses, and making bookmarks at the top of the content so that it is easier and faster to scroll to the required information in the content. Another suggestion was that if there are hidden tasks in the Moodle page by the teacher, the student would not be able to achieve a 100%, but a 99% course completion by ticking the tasks as completed, which annoyed one student.

3 – Entertaining

Table 14. Quantified data of mentioned topics by respondents for question 3.

Mentioned Topic	3 - Entertaining																									
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male												
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Pleasant to use	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Not entertaining (not much)	13	1	3.4	0.1	1	1	1	3	0	1	0	3.4	7	0	1	2	3	0	0	0	3.3	6
Layout_Design	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
Just sending assignments	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Interactivity	3	-1	4.0	0.0	0	0	0	1	0	0	0	4.0	1	0	0	0	2	0	0	0	4.0	2
Improve	2	-2	3.5		0	0	0	0	0	0	0		0	0	0	1	1	0	0	0	3.5	2
Entertainment - not important	8	-2	3.9	1.3	0	0	0	2	0	1	0	4.7	3	0	1	1	3	0	0	0	3.4	5
Entertaining	2	0	4.5	-1.0	0	0	0	1	0	0	0	4.0	1	0	0	0	0	1	0	0	5.0	1
Depends course_content_teacher	8	-2	3.4	-1.7	1	1	0	1	0	0	0	2.3	3	0	0	1	3	1	0	0	4.0	5
Colours_Visuality	6	0	3.7	0.0	0	1	1	0	0	1	0	3.7	3	0	0	1	2	0	0	0	3.7	3
3 Evaluation	18	0	3.4	-0.4	1	2	2	3	0	1	0	3.2	9	0	1	2	5	1	0	0	3.7	9
3 Bad	6	0	2.8	0.3	0	1	1	1	0	0	0	3.0	3	0	1	2	0	0	0	0	2.7	3
3 Good	2	0	4.5	-1.0	0	0	0	1	0	0	0	4.0	1	0	0	0	0	1	0	0	5.0	1
3 Neutral	10	0	3.6	-0.8	1	1	1	1	0	1	0	3.2	5	0	0	0	5	0	0	0	4.0	5
Total (unique)	20	0	3.5	-0.4	1	2	2	4	0	1	0	3.3	10	0	1	2	6	1	0	0	3.7	10

Respondents tend to characterize Moodle as not being entertaining. Simultaneously, 8 students stated that Moodle is a school app, and hence it does not have to be entertaining. 8 respondents mentioned that course could be more entertaining if the content or the teacher makes that course entertaining. 6 people mentioned something about the colours of the course or the visual part of the website – most of them tend to state that colours are neutral or bleak, consisting mostly of white, with just one student saying that the colours are fun. Several respondents proposed to make brighter colours, for example, such as the university's official colours (red and yellow). Another student stated that the design of the Moodle layout could be improved. Other students proposed to introduce more visuality, such as more images in the content. 3 students stated that interactivity is positively correlated with how much they are entertained while using Moodle (such as having quizzes to answer instead of only reading the plain text).

4 – Productivity

Table 15. Quantified data of mentioned topics by respondents for question 4.

Mentioned Topic	4 - Productivity																									
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male												
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Better than library	2	-2	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	2	0	6.0	2
Calendar	2	0	5.0	0.0	0	0	0	0	1	0	0	5.0	1	0	0	0	0	1	0	0	5.0	1
Content separation by topics	2	2	6.0		0	0	0	0	1	0	1	6.0	2	0	0	0	0	0	0	0		0
Dependant on Moodle	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Depends on the course_Teacher	3	-1	5.3	-0.5	0	0	0	0	1	0	0	5.0	1	0	0	0	0	1	1	0	5.5	2
Doesn't help to be productive	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Easy to find information	11	-5	5.5	-0.8	0	0	0	0	3	0	0	5.0	3	0	0	0	0	2	6	0	5.8	8
Encourages to be productive	2	2	5.0		0	0	0	0	2	0	0	5.0	2	0	0	0	0	0	0	0		0
Monitor deadlines	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Overview of the course_Tasks	4	0	5.8	-0.5	0	0	0	0	1	1	0	5.5	2	0	0	0	0	0	2	0	6.0	2
Tasks - easier to do	3	1	5.7	-0.5	0	0	0	0	1	1	0	5.5	2	0	0	0	0	0	1	0	6.0	1
Evaluation	19	1	5.5	-0.3	0	0	0	1	6	1	2	5.4	10	0	0	0	0	3	6	0	5.7	9
Neutral	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Good	17	-1	5.6	0.0	0	0	0	0	5	1	2	5.6	8	0	0	0	0	3	6	0	5.7	9
Bad	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Total (unique)	20	0	5.6	-0.3	0	0	0	1	6	1	2	5.4	10	0	0	0	0	3	7	0	5.7	10

Respondents, in general, tend to agree that Moodle allows them to be productive, but they outline different perspectives when they speak of productivity. 11 students stated that Moodle is either informative or provides means for easy finding the information. One student even stated that she felt *"dependent on Moodle*" since it helped her to find answers to the questions. In particular, 4 respondents underlined that Moodle gives an overview of the course or tasks in Moodle. One student characterized very high productivity of Moodle *"in the sense that it [Moodle] helps to monitor all tasks and assignments that I have to accomplish."* The same student also mentioned the calendar as the main helpful in that sense feature that provides an overview of deadlines. Another respondent stated that the calendar feature is productive because it is integrated with the Google Calendar. Simultaneously, not all of the students use calendar feature – only two respondents stated that they find calendar feature as helping them being productive. One respondent stated that Moodle is just for contacting the teacher, and the calendar feature is not used.

Three students stated that productivity also depends on the course, the information, or how the teacher organizes and structures that information. One even stated that productivity comes only from the quality of information, rather than from Moodle at all. Two respondents stated that structuring the content, such as separation by topics, helps to become more productive. The opposite of this – the lack of separation by topics – leads to the "wall of text" effect, when the course loses in informativity. Two stated that they considered Moodle to be productive because it was better to search for information in Moodle, rather than in the library, and the teacher helped with this by providing extracts from course books and articles to read. Two stated that Moodle by itself encourages to be productive – one felt that she had to start doing stuff when she logged into Moodle, whereas the other mentioned percentages that allowed to monitor the completion of the courses.

5 – Novelty

Table 16. Quantified data of mentioned topics by respondents for question 5.

	5 - Novelty																							
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male										
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Doesn't have to be novel	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Everyone is using it	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Felt confused at first	1	1	1.0		1	0	0	0	0	0	0	1.0	1	0	0	0	0	0	0	0		0
Layout feels old	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Not novel if used other LMS before	3	-1	4.7	2.0	0	0	0	0	0	1	0	6.0	1	0	0	1	0	1	0	0	4.0	2
Novelty - how easy to use	4	-2	3.8	-3.7	1	0	0	0	0	0	0	1.0	1	0	0	0	1	2	0	0	4.7	3
Other LMSs	4	-2	4.5	2.0	0	0	0	0	0	1	0	6.0	1	0	0	1	1	1	0	0	4.0	3
Some things are still novel	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Use daily	2	2	2.5		1	0	0	1	0	0	0	2.5	2	0	0	0	0	0	0	0		0
Used for a long time	9	3	2.7	-1.5	4	0	0	1	1	0	0	2.2	6	1	0	0	1	0	1	0	3.7	3
Was novel at first	5	-1	3.6	-0.2	1	0	0	0	0	1	0	3.5	2	0	0	1	2	0	0	0	3.7	3
Evaluation	17	-1	3.6	-1.2	4	0	0	1	2	1	0	3.0	8	1	0	0	4	3	1	0	4.2	9
Neutral	2	0	4.5	1.0	0	0	0	0	1	0	0	5.0	1	0	0	0	1	0	0	0	4.0	1
Not novel	11	1	3.0	-1.5	4	0	0	1	0	1	0	2.3	6	1	0	0	2	2	0	0	3.8	5
Novel	4	-2	5.0	0.0	0	0	0	0	1	0	0	5.0	1	0	0	0	1	1	1	0	5.0	3
Total (unique)	20	0	3.5	-1.2	5	0	0	2	2	1	0	2.9	10	1	0	1	4	3	1	0	4.1	10

People generally tend to state that Moodle was not novel for them for multiple reasons – 11 people stated that it was not novel directly. However, there were some stating that it was still novel for them. 9 stated that they had used Moodle for a long time, out of which only a couple stated that Moodle at least partially remained novel for them. Simultaneously, 5 respondents confessed that Moodle was novel at first when they first started using it. In particular, 3 respondents stated that Moodle was not novel because they have used other LMSs before, such as Wilma in high school. When they used these other systems, the concept of LMS was novel to them; however, it tended to change over a long period of use or regular, daily use (2 respondents). There were other less frequently mentioned topics. One stated feeling confused at first in terms of having trouble distinguishing between Moodle and other intranet platforms of the university. Another claimed that some things were still novel, such as having difficulties with locating the courses to enroll, whether features that are frequently used are not considered as novel. One stated that everyone is using Moodle, so it does not feel novel. One mentioned that the layout feels old, although the platform itself is a kind of novel. Finally, one stated that Moodle does not have to be novel, nor that it could affect the enjoyment of using the platform in any way.

There were certain troubles by the respondents in understanding the question. Many people had asked what does the word novelty mean, with the researcher consequently trying to explain it to the participants, sometimes with a metaphor of how novel it was to have iPhone when it was first invented, and how novel it was nowadays when many of people have smartphones. Sometimes, the researcher translated the word novelty into Finnish (for the Finnish participants, who were mostly asking for explanations) – uusi or uuden. Other informants, when asked the question to rate novelty often started to explain how easy it was to use Moodle, after which the researcher has asked them to focus on the novelty instead. In some of the cases, informants described the novelty together with how difficult or easy it was to use Moodle.

6 – Reliability

Table 17. Quantified data of mentioned topics by respondents for question 6.

	6 - Reliability																										
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male													
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Depends on teachers	2	2	4.5		0	0	0	1	1	0	0	4.5	2	0	0	0	0	0	0	0		0
Easy to use	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
No problems	9	-1	5.8	1.3	0	0	0	0	1	0	3	6.5	4	0	0	0	1	2	2	0	5.2	5
Technical issues	10	-2	5.8	-0.9	0	0	0	1	1	2	0	5.3	4	0	0	0	0	0	5	1	6.2	6
Broken links from teachers	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Didn't work in the beginning	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Heard stories of problems	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Menu on the left is long - can't see courses	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Problems logging in	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Service_maintenance breaks	7	-1	5.7	-1.3	0	0	0	1	1	1	0	5.0	3	0	0	0	0	0	3	1	6.3	4
Working slowly_Clunky to use	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Evaluation	20	0	5.7	-0.1	0	0	0	2	3	2	3	5.6	10	0	0	0	1	2	6	1	5.7	10
Bad	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Good	18	-2	5.8	0.2	0	0	0	1	2	2	3	5.9	8	0	0	0	1	2	6	1	5.7	10
Neutral	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Total (unique)	20	0	5.7	-0.1	0	0	0	2	3	2	3	5.6	10	0	0	0	1	2	6	1	5.7	10

9 respondents stated that there were no problems that they have faced, whereas the majority of other students stated that there were only minor problems encountered, mostly related to technical issues. 7 said to have faced service breaks, such as server downtime or website's inaccessibility. However, they claimed that it was mostly at night, and as such did not disturb them. Sometimes, they were informed in advance about the potential service breaks, which also helped them to limit the disturbance from service breaks. Other problems were mentioned by single respondents, some of these said that they suspected that these might have been not on the user's side (such as slow PC connection). There were occasional problems of logging in. Sometimes Moodle worked slowly or clunky. One stated that LMS did not work smoothly for him in the beginning, but it became better later. The menu on the left was also stated to be too long, so that not all of the courses could be seen. One was concerned with occasional broken links (which could not be accessed via the browser) provided by the teachers. Another stated that he did not personally encounter any problems but heard stories of it. Finally, two students stated that reliability depends on the teacher, whereas one commented that Moodle was easy to use when answering this question.

7 – Efficiency

Table 18. Quantified data of mentioned topics by respondents for question 7.

	7 - Efficiency																								
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male											
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
User-friendly	2	-2	5.5		0	0	0	0	0	0	0		0	0	0	0	0	1	1	0	5.5	2
Tasks_Assignments	5	1	6.0	0.8	0	0	0	0	0	2	1	6.3	3	0	0	0	0	1	1	0	5.5	2
Structured content	3	1	5.3	2.0	0	0	0	0	0	2	0	6.0	2	0	0	0	1	0	0	0	4.0	1
Overview of the course	3	1	6.0	0.0	0	0	0	0	0	2	0	6.0	2	0	0	0	0	0	1	0	6.0	1
Motivates	2	2	5.0		0	0	0	0	2	0	0	5.0	2	0	0	0	0	0	0	0		0
Helps allocating time	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Everything is in the same place	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Depends on the student	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Depends on teacher	3	-3	5.7		0	0	0	0	0	0	0		0	0	0	0	0	1	2	0	5.7	3
Complements study	2	0	6.0	0.0	0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	1	0	6.0	1
Clear	2	2	6.5		0	0	0	0	0	1	1	6.5	2	0	0	0	0	0	0	0		0
Access material	2	2	5.5		0	0	0	1	0	0	1	5.5	2	0	0	0	0	0	0	0		0
Features	4	2	5.8	-0.3	0	0	0	0	1	2	0	5.7	3	0	0	0	0	0	1	0	6.0	1
Calendar	2	0	6.0	0.0	0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	1	0	6.0	1
Percentage of the course	2	2	5.5		0	0	0	0	1	1	0	5.5	2	0	0	0	0	0	0	0		0
Evaluation	18	-2	5.6	0.7	0	0	0	0	2	4	2	6.0	8	0	0	0	2	3	5	0	5.3	10
Bad	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0
Neutral	3	-3	4.3		0	0	0	0	0	0	0		0	0	0	0	2	1	0	0	4.3	3
Good	15	1	5.9	0.3	0	0	0	0	2	4	2	6.0	8	0	0	0	0	2	5	0	5.7	7
Total (unique)	20	0	5.6	0.5	0	0	0	1	2	5	2	5.8	10	0	0	0	2	3	5	0	5.3	10

People tend to agree that Moodle is generally efficient to use in studies. 5 stated that Moodle helps in several ways with the school tasks and assignments, such as being easy to submit the files in there for the teacher or to access the information needed for completing the tasks. 3 claimed that Moodle is efficient if the content is structured. As such, two of the students stated that efficiency depends on the teacher and how he or she uses the Moodle. However, one student stated that efficiency depends on him, whereas Moodle by itself provides all the necessary things in one place in order to be efficient. Two stated that Moodle is efficient because it is clear –

such in terms of clearly structured content or clear visual representation. Two stated that Moodle provides access to information and course content. Two stated that Moodle is user-friendly. Two other students stated that Moodle complements their studies. Two stated that Moodle motivates them to study and thus to be more efficient in studying. There were several features outlined that are helping with efficiency – a percentage of the course completion progress and the calendar. Finally, one stated that Moodle helps in allocating the time for doing the tasks.

8 - User-friendliness

Table 19. Quantified data of mentioned topics by respondents for question 8.

	8 - User-friendliness																						
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male									
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Depends on the teacher_Course	4	2	4.3	1.7	0	0	0	2	0	1	0	4.7	3	0	0	1	0	0	0	0	3.0	1
Easy_Intuitive	12	2	5.0	0.3	0	0	0	4	0	1	2	5.1	7	0	0	1	2	0	1	1	4.8	5
Improve	7	-3	4.3	-1.8	0	1	0	1	0	0	0	3.0	2	0	0	1	2	0	1	1	4.8	5
Layout_UI	5	-1	4.2	1.3	0	0	0	1	0	1	0	5.0	2	0	0	1	2	0	0	0	3.7	3
Phone_Mobile version	2	2	5.0		0	0	0	1	0	1	0	5.0	2	0	0	0	0	0	0	0		0
Information (eg about courses)	10	-2	3.9	-0.3	0	1	0	2	1	0	0	3.8	4	0	0	3	2	0	0	1	4.0	6
Communication with others	3	3	5.3		0	0	0	1	1	0	1	5.3	3	0	0	0	0	0	0	0		0
Courses	7	-3	4.1	-0.2	0	0	0	2	0	0	0	4.0	2	0	0	2	2	0	0	1	4.2	5
Navigating in Moodle	5	1	4.0	-1.7	0	1	0	2	0	0	0	3.3	3	0	0	1	0	0	0	1	5.0	2
Length_Experience of use	7	1	4.1	0.8	0	1	0	1	1	0	1	4.5	4	0	0	1	2	0	0	0	3.7	3
Evaluation	20	0	4.7	0.5	0	1	0	4	1	2	2	4.9	10	0	0	3	4	0	2	1	4.4	10
Bad	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0
Good	15	-1	4.9	0.5	0	0	0	4	0	1	2	5.1	7	0	0	2	3	0	2	1	4.6	8
Neutral	5	1	4.0	0.8	0	1	0	0	1	1	0	4.3	3	0	0	1	1	0	0	0	3.5	2
Total (unique)	20	0	4.7	0.5	0	1	0	4	1	2	2	4.9	10	0	0	3	4	0	2	1	4.4	10

12 people stated that overall, Moodle is easy or intuitive to use, although underlining different aspects of Moodle while stating that it is easy or intuitive to use and that there are also some issues present in Moodle. 10 mentioned something concerning the information that is represented in Moodle. 7 stated that they faced certain issues with the courses in Moodle, such as having troubles of locating how to add new courses (which required of them to locate not an obvious link) or issues with categorizing and going to the content of the courses. Sometimes, however, these issues were solved after users have used Moodle for some time. 5 others continued that Moodle can be sometimes tricky to find information, such as the problems as mentioned earlier with locating the courses to enroll. 2 of the informants also stated that they had some problems with using the communication features of Moodle, whereas one stated that the feature of discussion forums was most user-friendly in Moodle.

6 described user-friendliness of Moodle with respect to the users' experience or length of using Moodle, mostly stating that the use of Moodle has become easier over time, although there might have been some issues in the beginning of the use of Moodle. For example, one informant mentioned, *"I learned to use it in a pretty short period of time."* 5 mentioned layout or user interface of Moodle to be somehow related to the user-friendliness. Some found this part of being clear and minimalistic, as well as user-friendly, whereas others said that layout is not user friendly and

should be improved, in particular how new courses are added. 4 stated that user-friendliness depends on the course or the teacher. Two users stated that the mobile version of Moodle is not very user-friendly and should be made more such. 7 respondents proposed improvement ideas in terms of user-friendliness of Moodle. Among the suggestions are to categorize information in Moodle, to make locating the enrollment to courses feature easier, to be able to filter or categorize the courses according to the user's criteria, to make a help to-do list in terms of how to use Moodle, and to make more interactive links in Moodle.

9 – Attractiveness

Table 20. Quantified data of mentioned topics by respondents for question 9.

	9 - Attractiveness																									
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male												
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
UI elements	3	-1	4.3	4.0	0	0	0	0	0	0	1	7.0	1	0	1	0	1	0	0	0	3.0	2
Pleasant to use	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Not attractive	3	-3	2.7		0	0	0	0	0	0	0		0	0	1	2	0	0	0	0	2.7	3
No need for being attractive	4	-4	2.8		0	0	0	0	0	0	0		0	0	2	1	1	0	0	0	2.8	4
Neutral_plain	6	0	4.3	0.7	0	0	1	1	0	0	1	4.7	3	0	0	0	3	0	0	0	4.0	3
Length of use	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Interactive	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Improve	6	0	2.8	-1.0	0	2	1	0	0	0	0	2.3	3	0	1	1	0	1	0	0	3.3	3
Font	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Design	2	0	4.0	-2.0	0	0	1	0	0	0	0	3.0	1	0	0	0	0	1	0	0	5.0	1
Depends on the teacher	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Colours	7	5	4.0	0.0	0	2	1	1	0	1	1	4.0	6	0	0	0	1	0	0	0	4.0	1
Clear_Simple_Minimalistic	4	4	3.5		0	1	1	1	1	0	0	3.5	4	0	0	0	0	0	0	0		0
Boring	5	-1	2.2	-0.3	0	2	0	0	0	0	0	2.0	2	0	2	1	0	0	0	0	2.3	3
Evaluation	20	0	3.6	0.5	0	3	2	2	1	1	1	3.8	10	0	3	2	4	1	0	0	3.3	10
Bad	6	-2	2.3	-0.5	0	2	0	0	0	0	0	2.0	2	0	2	2	0	0	0	0	2.5	4
Good	2	2	5.5		0	0	0	1	0	0	1	5.5	2	0	0	0	0	0	0	0		0
Neutral	12	0	3.8	0.0	0	1	2	1	1	1	0	3.8	6	0	1	0	4	1	0	0	3.8	6
Total (unique)	20	0	3.6	0.5	0	3	2	2	1	1	1	3.8	10	0	3	2	4	1	0	0	3.3	10

Users either were stating that the attractiveness of Moodle is either neutral or plain or that Moodle was boring. In one student's words, a lengthy experience of using Moodle has caused it to be boring. 3 students claimed that Moodle was not attractive to them. Simultaneously, many of the respondents stated that Moodle does not have to be attractive (4 respondents), whereas others stated that they liked the attractiveness of Moodle that was judged to be clear, simple, or minimalistic (4 respondents). 7 respondents stated something concerning the colours of Moodle – either stating that they are *"pretty good,"* or that they are too stale and lack the colourfulness. One student proposed to use brighter colours, whereas another student proposed to use the university's official colours (yellow and red) in the design of Moodle. Fonts not described as attractive by one student, who proposed to make fonts more interesting to improve the attractiveness of Moodle, for example, by having different fonts for different types of information. At the same time, the structure of Moodle was characterized as interactive and pleasant to use by another informant. One student stated that attractiveness depends on how the teacher customizes the layout of Moodle.

10 – Enjoyment

Table 21. Quantified data of mentioned topics by respondents for question 10.

Mentioned Topic	10 - Enjoyment																									
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male												
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Visuality	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Sometimes	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Not important_Just a tool	4	-2	4.8	0.3	0	0	0	0	1	0	0	5.0	1	0	0	0	2	0	1	0	4.7	3
Not enjoyful	1	1	2.0		0	1	0	0	0	0	0	2.0	1	0	0	0	0	0	0	0		0
Mobile version	2	0	5.0	2.0	0	0	0	0	0	1	0	6.0	1	0	0	0	1	0	0	0	4.0	1
Media player	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Interactivity	2	-2	5.5		0	0	0	0	0	0	0		0	0	0	0	0	1	1	0	5.5	2
Improve	3	-1	5.3	1.0	0	0	0	0	0	1	0	6.0	1	0	0	0	1	0	1	0	5.0	2
Helps finding information	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Forums_Communication	3	-1	5.3	2.5	0	0	0	0	0	0	1	7.0	1	0	0	1	0	0	1	0	4.5	2
External links	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Everything in one place	4	2	4.5	-0.7	0	1	0	0	1	1	0	4.3	3	0	0	0	0	1	0	0	5.0	1
Enjoy using	7	-1	4.7	1.1	0	0	0	1	1	0	1	5.3	3	0	0	1	1	2	0	0	4.3	4
Easy_Simple to use	5	-3	5.0	2.5	0	0	0	0	0	0	1	7.0	1	0	0	1	0	3	0	0	4.5	4
Design	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Depends on the course	2	2	4.0		1	0	0	0	0	0	1	4.0	2	0	0	0	0	0	0	0		0
10 - Evaluation	19	-1	4.3	0.0	1	2	0	1	2	1	2	4.3	9	0	0	2	4	3	1	0	4.3	10
10 Bad	1	1	2.0		0	1	0	0	0	0	0	2.0	1	0	0	0	0	0	0	0		0
10 Good	9	-1	4.7	1.1	0	1	0	0	1	0	2	5.3	4	0	0	1	2	2	0	0	4.2	5
10 Neutral	9	-1	4.2	-0.4	1	0	0	1	1	1	0	4.0	4	0	0	1	2	1	1	0	4.4	5
Total (unique)	20	0	4.4	0.1	1	2	0	1	3	1	2	4.4	10	0	0	2	4	3	1	0	4.3	10

The students were somewhat divided on the topic of enjoyment from the use of Moodle. Some acknowledged that they enjoyed using Moodle. Some stated that they were neutral about the enjoyment of the use of Moodle. At the same time, among other students, the understanding by some was that Moodle was just a tool for studies, and hence enjoyment was not important (4 students). Simultaneously, among these coded references from respondents, frequently, students were contradicting. For example, quoting one, he stated that *"It's school work, I'd rather not do it. The positive thing about it is that it works on the phone really well. So, I could say I enjoy using it because it works on the phone really well."* One stated that Moodle was not enjoyful. One said that she enjoyed using Moodle sometimes – namely because Moodle had everything in one place.

5 students commented that they found Moodle easy and simple to use. 4 other stated that they enjoyed Moodle for the fact that everything in Moodle was in one place. One mentioned that she enjoyed using Moodle because it helped in finding helpful information about the courses. 3 stated something concerning the communication of Moodle. One enjoyed using the communication features of Moodle. The other two proposed to improve Moodle by implementing a chat function or thinking about the ways of communication in the courses, such as providing Q&A and contact with us sections – thus with the potential to increase the enjoyment from using Moodle. Two stated that enjoyment from using Moodle depends on the course, such as having interactive content would increase the enjoyment of using Moodle. One stated that it was enjoyful to use Moodle because of its design.

One stated that using a mobile version of Moodle was challenging because Moodle did not have its own media player, and the links frequently led to external links to

media hosted on a YouTube. As a result, she had to watch advertisements due to the lack of special software on the mobile YouTube to block the ads. In addition, quoting the respondent, *"then in my video suggestions there will be just a bunch of crap about school, mixed with the content I usually watch,"* such as information behavior models mixed with content about losing weight. At the same time, another student said that he enjoyed using Moodle because it was working really well on the phone. Comparing with YouTube, another student stated that enjoyment from YouTube and Moodle differed in that Moodle demanded more active use, whereas YouTube was more about passive browsing and viewing of recommended videos. YouTube was also found to be more visual, whereas Moodle less so.

11 – Fulfilness

Table 22. Quantified data of mentioned topics by respondents for question 11.

Mentioned Topic	11 - Fulfillness																					
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male								
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Depends on student	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Depends on teacher_Course	6	4	5.5	-0.6	0	0	0	2	0	2	1	5.4	5	0	0	0	0	0	1	0	6.0	1
Grades	12	-2	5.3	-0.2	0	0	0	2	0	3	0	5.2	5	0	0	0	1	2	4	0	5.4	7
Didn't increase grade	2	0	4.0	0.0	0	0	0	1	0	0	0	4.0	1	0	0	0	1	0	0	0	4.0	1
Increased grade	10	-2	5.6	-0.2	0	0	0	1	0	3	0	5.5	4	0	0	0	0	2	4	0	5.7	6
Calendar	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Criteria	3	1	6.0	0.0	0	0	0	0	0	2	0	6.0	2	0	0	0	0	0	1	0	6.0	1
Extra material	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Information	3	-1	5.3	-2.0	0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	2	0	6.0	2
Interact in a different way	2	-2	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	2	0	6.0	2
Tests	2	0	4.5	-1.0	0	0	0	1	0	0	0	4.0	1	0	0	0	0	1	0	0	5.0	1
Ticking boxes (% bar)	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Upload_Download	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Layout	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Task	9	1	5.3	1.1	0	0	0	1	0	3	1	5.8	5	0	0	0	2	1	1	0	4.8	4
Calendar	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Criteria	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Grading system	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Sharing files	5	-3	4.6	-0.8	0	0	0	1	0	0	0	4.0	1	0	0	0	2	1	1	0	4.8	4
Ticking boxes near tasks	2	2	6.0		0	0	0	0	0	2	0	6.0	2	0	0	0	0	0	0	0		0
11 Evaluation	16	2	5.4	0.0	0	0	1	2	0	4	2	5.4	9	0	0	0	2	0	5	0	5.4	7
11 Doesn't help_Not good	2	2	3.5		0	0	1	1	0	0	0	3.5	2	0	0	0	0	0	0	0		0
11 Good	13	1	5.7	0.7	0	0	0	1	0	4	2	6.0	7	0	0	0	2	0	4	0	5.3	6
11 Neutral	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Total (unique)	20	0	5.3	0.1	0	0	1	3	0	4	2	5.3	10	0	0	0	3	2	5	0	5.2	10

The majority of students (13) state that Moodle is somewhat good in terms of its fulfilness, whereas 2 stated that it is not good or that it does not help in that regard, and 1 mentioned it to be somewhat neutral. Many stated that Moodle's fulfilness is affected by the teacher (6), whereas one student stated that she found that Moodle provides all the necessary opportunities, and the fulfilness depends on her and how she uses Moodle.

Frequently students were asked whether Moodle has helped them to improve or increase their grades (12) – either as a question that explains what fulfilness means or as an additional question to the standardized semi-structured question. As a result, 10 considered that Moodle either improved or has given opportunities to improve grades of the students. Grades might have been improved because of having information regarding the criteria for how the assignments will be evaluated

(3), being an easy place to access useful information (3), or by reading uploaded extra material uploaded by the teachers (1).

Other ways included being able to interact with a material in a different way, such as reading digital information and extracts from the books instead of whole books (2). Tests were found to be positive for increasing grades (2). There were also some features that were positively outlined by students as having the potential to improve their grades: a calendar feature (1), ticking boxes near tasks signifying completion of them (1), or an ability to upload and download assignments (1). Simultaneously, 2 students stated that Moodle does not help increasing grades, with one stating that it depends on the teacher, rather than on Moodle. Additionally, other things were mentioned by the informants. The layout was mentioned to be working fine (1). Sharing files were somehow related to the fulfilness of Moodle (5), which is mentioned either as the only feature that is used or as the feature that helps increasing grades.

12 – Comprehensiveness

Table 23. Quantified data of mentioned topics by respondents for question 12.

	12 - Comprehensiveness																								
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male											
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Communication methods	13	-3	4.6	0.0	0	0	2	1	0	1	1	4.6	5	0	0	2	2	1	3	0	4.6	8
Content types (text, imgs, etc)	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
email	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Forums	11	-3	4.7	0.0	0	0	2	0	0	1	1	4.8	4	0	0	2	1	1	3	0	4.7	7
in-person	2	2	5.5		0	0	0	1	0	0	1	5.5	2	0	0	0	0	0	0	0		0
personal messages	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Q&A section	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
wiki	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Depends on the course	2	-2	4.5		0	0	0	0	0	0	0		0	0	0	0	1	1	0	0	4.5	2
Improve	3	-3	4.7		0	0	0	0	0	0	0		0	0	0	0	2	0	1	0	4.7	3
Other people	10	4	4.7	0.0	0	0	2	1	2	1	1	4.7	7	0	0	1	0	1	1	0	4.7	3
Issues with personalities	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Issues with words	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
Teacher encouragement	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
With students	9	3	4.9	0.3	0	0	1	1	2	1	1	5.0	6	0	0	1	0	1	1	0	4.7	3
With teacher	5	1	5.6	0.2	0	0	0	0	2	0	1	5.7	3	0	0	0	0	1	1	0	5.5	2
Evaluation	14	2	4.4	0.0	0	0	3	2	1	1	1	4.4	8	0	0	1	3	1	1	0	4.3	6
Bad	5	1	3.4	-0.2	0	0	2	1	0	0	0	3.3	3	0	0	1	1	0	0	0	3.5	2
Good	5	1	5.4	-0.2	0	0	0	1	1	0	1	5.3	3	0	0	0	0	1	1	0	5.5	2
Neutral	4	0	4.3	0.5	0	0	1	0	0	1	0	4.5	2	0	0	0	2	0	0	0	4.0	2
Total (unique)	20	0	4.7	0.1	0	0	3	2	2	1	2	4.7	10	0	0	2	3	2	3	0	4.6	10

Comprehensiveness was evaluated to be somewhat good or helpful (5), neutral or ok (4) and being bad or not that helpful (5) by a roughly equal number of respondents. 2 stated that the comprehensiveness depends on how the teacher has structured the course content and whether the information structured in a clear and accessible way. One student commented that roughly 30% of courses are poorly structured, 50% are ok, and 20% are good in the sense of how the course is structured by the teacher.

14 respondents commented on something on the communication methods as part of their answers: discussion forums (11), in-person communication (2), e-mail (1),

personal messages (1), wiki (1), and Q&A section (1). Discussion forums were noted by some to be helpful and having interesting discussions that may help with the understanding of teachers or students. Others stated there are certain issues with discussion forums, such as a feeling of a "fake" or "unreal" discussion, that it may be hard to express oneself through Moodle because only of being able to use texts (instead of other media like images or videos), or that forums are not often used. As a result, in-person communication or e-mails were sometimes preferred to communicate through Moodle, especially with teachers. Certain improvements are suggested, such as personal messages, wikis, and Q&A sections to be more widely used, as they were noted to be useful and helpful, but not widely used.

10 respondents mentioned things related to other people when answering the question. They mentioned communication with other students (9), with teachers (5). It is suggested that comprehensiveness provided by Moodle differs for communication with students and with teachers, as well as different problems when communicating with students or with teachers. Teacher's encouragement (1) might have been helpful in terms of using discussion forums. Issues with personalities of other people (1) and issues with words used by others (1) when communicating through Moodle might have decreased the comprehensiveness.

13 – Meaningfulness

Table 24. Quantified data of mentioned topics by respondents for question 13.

	13 - Meaningfulness																								
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male											
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Calendar	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Course content	6	0	5.5	-0.3	0	0	0	1	1	0	1	5.3	3	0	0	0	0	1	2	0	5.7	3
Depends on teacher_Course	9	-3	5.2	-0.8	0	0	1	0	1	1	0	4.7	3	0	0	0	1	1	4	0	5.5	6
Extra articles	3	3	5.3		0	0	0	1	1	0	1	5.3	3	0	0	0	0	0	0	0		0
Facilitates studying	2	2	5.5		0	0	0	1	0	0	1	5.5	2	0	0	0	0	0	0	0		0
Improve	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Tasks_Deadlines	3	1	5.3	-1.0	0	0	0	0	2	0	0	5.0	2	0	0	0	0	0	1	0	6.0	1
Ways of interaction	1	-1	7.0		0	0	0	0	0	0	0		0	0	0	0	0	0	0	1	7.0	1
Evaluation	15	-1	6.0	0.5	0	0	0	0	2	1	4	6.3	7	0	0	0	1	1	5	1	5.8	8
Bad	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0
Good	11	1	6.3	0.1	0	0	0	0	2	0	4	6.3	6	0	0	0	0	0	4	1	6.2	5
Neutral	4	-2	5.3	1.0	0	0	0	0	0	1	0	6.0	1	0	0	0	1	1	1	0	5.0	3
Total (unique)	19	-1	5.7	-0.1	0	0	1	1	2	1	4	5.7	9	0	0	0	1	1	7	1	5.8	10

Moodle was characterized as meaningful by most of the informants, in particular by providing meaningful information, although there were some, who stated that Moodle was ok, neutral or that Moodle by itself is a *"blank slate and it depends on what type of information the teacher uploads there."* Moodle was also found to be facilitating studying (2). Furthermore, there were some who claimed that meaningfulness of Moodle depends on how the teacher structures the content (9). Multiple people stated something concerning the course content (6): that the content should be structured simple and clear; powerpoints, articles, and pdf files were found to be meaningful; and that the content is the main factor affecting meaningfulness of Moodle. Additionally, Moodle provides interaction with digital materials not possible otherwise (1). Furthermore, 3 students stated that they consider extra articles published by the teachers to be meaningful, although they are

not always read if a student does not have the time or considers to have already acknowledged the content of the extra article in previous studies. The presence of tasks and deadlines in Moodle were characterized to be meaningful (3), and calendar as a feature improves the use of that meaningful information (1).

14 – Engagement

Table 25. Quantified data of mentioned topics by respondents for question 14.

Mentioned Topic	14 - Engagement																					
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male								
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Course content	7	-1	4.9	-0.3	0	1	0	0	0	2	0	4.7	3	0	0	1	1	0	1	1	5.0	4
Everything in one place	1	-1	7.0		0	0	0	0	0	0	0		0	0	0	0	0	0	0	1	7.0	1
Interactivity	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Interesting	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Visuality_Different types of content	4	-2	4.8	1.7	0	0	0	0	0	1	0	6.0	1	0	0	1	1	0	1	0	4.3	3
Daily use	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Depends on teach_course	6	4	4.7	-0.4	0	1	0	1	1	2	0	4.6	5	0	0	0	0	1	0	0	5.0	1
Engagement by the teacher	4	2	4.0	1.3	0	1	0	0	1	1	0	4.3	3	0	0	1	0	0	0	0	3.0	1
Features	5	1	4.8	1.3	0	0	0	1	0	2	0	5.3	3	0	0	1	0	1	0	0	4.0	2
% bar	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Course evaluation	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Easy way to DL documents	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Quiz	2	2	6.0		0	0	0	0	0	2	0	6.0	2	0	0	0	0	0	0	0		0
Feels one have to study	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Forced_Engagement	5	3	5.6	-1.8	0	1	0	0	0	2	1	5.3	4	0	0	0	0	0	0	1	7.0	1
Improve	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Makes it easy	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Tasks	5	-1	4.6	-1.0	0	1	0	0	0	1	0	4.0	2	0	0	0	2	0	0	1	5.0	3
Sending tasks_assignments	2	2	4.0		0	1	0	0	0	1	0	4.0	2	0	0	0	0	0	0	0		0
Tasks_Deadlines	4	-2	5.3	1.0	0	0	0	0	0	1	0	6.0	1	0	0	0	2	0	0	1	5.0	3
Evaluation	13	1	5.2	0.3	0	1	0	1	1	2	2	5.3	7	0	0	1	1	2	1	1	5.0	6
Bad	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Good	11	3	5.5	-0.5	0	1	0	1	1	2	2	5.3	7	0	0	0	0	2	1	1	5.8	4
Neutral	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Total (unique)	20	0	5.2	0.2	0	1	0	2	1	4	2	5.3	10	0	0	1	3	2	2	2	5.1	10

Many people stated that they felt engaged by the Moodle, whereas one stated that it was neutral, and one mentioned that Moodle does not really engage. One mentioned high daily use as a justification of rating engagement as pretty high. The course content was frequently mentioned in the responses. Visuality and different types of content, such as images and videos, were positively rated by 3 respondents and were preferred to read a text material, whereas one stated that reading a physical book was preferred to viewing digital content. The interactivity of the content (1) or having everything in one place that allows for an overview to plan studies (1) were also found to be facilitating engagement. One respondent also mentioned that she would have preferred to have interesting content as an engaging one, although she has stated that she realized that it is not always possible when studying. 6 respondents stated that engagement depends on how a teacher structures content of a course. Furthermore, the teacher was noted to be an engaging factor by some (4).

Simultaneously, 5 spoke of engagement having a somehow forced engagement: being told by the teacher, or because a student has to. One mentioned that she felt that she had to study when she opened Moodle. Tasks were noted in the responses

(5): deadlines of assignments (4) and having to send assignments via Moodle (2) increased engagement. Additionally, there were some features that were mentioned by the respondents as engaging: task quizzes (2), easiness of downloading documents (1), final course evaluation survey that is placed in Moodle (1), and percentage bar of completing tasks (1). One student commented that Moodle makes it easy to study.

15 – Communicativeness

Table 26. Quantified data of mentioned topics by respondents for question 15.

	15 - Communicativeness																					
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male								
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Allows to communicate, but dont use	6	-6	4.7		0	0	0	0	0	0	0		0	0	1	0	0	4	1	0	4.7	6
Discussion forums	13	-1	4.3	0.4	0	1	1	0	3	0	1	4.5	6	0	2	0	0	5	0	0	4.1	7
No_to_little use	7	3	3.4	2.0	0	1	1	0	3	0	0	4.0	5	0	2	0	0	0	0	0	2.0	2
Old school messaging system	5	-3	3.4	-0.5	0	0	1	0	0	0	0	3.0	1	0	2	0	0	2	0	0	3.5	4
Use by others	6	2	5.0	0.0	0	0	1	0	2	0	1	5.0	4	0	0	0	0	2	0	0	5.0	2
Face-to-face	4	0	3.3	-0.5	0	0	2	0	0	0	0	3.0	2	0	1	0	0	1	0	0	3.5	2
Helps to get to know in the beginning	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
Improve	5	-3	4.0	-1.3	0	0	1	0	0	0	0	3.0	1	0	1	0	0	3	0	0	4.3	4
Uploading tasks	2	-2	3.5		0	0	0	0	0	0	0		0	0	1	0	0	1	0	0	3.5	2
Using other platform	7	-1	3.6	0.2	0	0	2	0	1	0	0	3.7	3	0	2	0	0	2	0	0	3.5	4
With students	8	0	4.1	0.8	0	0	2	0	1	0	1	4.5	4	0	2	0	0	1	1	0	3.8	4
With teachers	11	-1	4.3	0.2	0	1	1	0	2	0	1	4.4	5	0	2	0	0	3	1	0	4.2	6
Evaluation	9	3	5.0	1.5	0	0	0	1	3	0	2	5.5	6	0	1	0	0	2	0	0	4.0	3
Bad	2	0	3.5	3.0	0	0	0	0	1	0	0	5.0	1	0	1	0	0	0	0	0	2.0	1
Good	3	3	6.0		0	0	0	1	0	0	2	6.0	3	0	0	0	0	0	0	0		0
Neutral	4	0	5.0	0.0	0	0	0	0	2	0	0	5.0	2	0	0	0	0	2	0	0	5.0	2
Total (unique)	20	0	4.3	0.2	0	1	3	1	3	0	2	4.4	10	0	3	0	0	6	1	0	4.2	10

People generally tend to be neutral, whereas a few expressed it to be good or bad. However, 6 respondents confirmed that Moodle allows in principle to communicate, but some of these informants stated that they prefer not to use it due to some reasons. Furthermore, communication with students (8) and with teachers (11) was described in separate terms. It was stated that, for the most part, communicating with teachers is more widespread with the use of Moodle than with the peers, however many preferred communicating with the teachers by e-mail.

Discussion forums were frequently mentioned (13) by the informants as the main feature that provides the communicativeness of Moodle. Even though some students were noted to enjoy using discussion forums to foster learning, much more explicated that the communication there felt too formal. Eight said that discussion forums were not used or used very little, although some admitted that the possibility through Moodle to communicate is present. The use of discussion forums was discussed in the context of use by others (6). Some said that if others used it more frequently and more actively, informants would have considered using it as well. Others stated that they felt that the tonality used by others when communicating on discussion forums was too formal and forced, as part of having to discuss in the teachers' assignments. One respondent felt that if the teacher engaged in using discussion forums more, it would have really helped. Furthermore, she expressed her feeling of trying to avoid asking *"stupid questions"* by avoiding asking at all,

although she also realized that others might have similar thoughts. Finally, 5 expressed Moodle's messaging system to be not suitable for their styles of communication. One informant has summarized it pretty well: *"It's not a chat, it's old-school, where you write a blog post."* As a result, some have stated that this does not allow for a lively discussion between students, which makes the discussions feel formal and somewhat surficial.

Four students stated something concerning face-to-face communication. One student of Philosophy stated that personal communication is preferred to other modes of communication. Another student stated that for group work, the meeting at the university is preferred unless there is a lack of time when Facebook or WhatsApp would be used. 2 students said that they could communicate with the teachers by uploading tasks in Moodle. Finally, one mentioned that at the beginning of studies, when one does not know many people yet, Moodle could be very useful because it helps to get to know each other, after which it would be possible to transition to other platforms. It was stated that frequently, other messaging platforms (8) were used (WhatsApp, e-mail, Facebook) – either instead of or in addition to that of Moodle's features that allow communicating, like discussion forums.

16 – Collaborativeness

Table 27. Quantified data of mentioned topics by respondents for question 16.

	16 - Collaborativeness																							
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male										
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
(Group)_Chats_Direct_Messages	6	0	4.3	0.0	0	0	2	0	0	0	1	4.3	3	0	0	1	1	0	1	0	4.3	3
Online Course	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
Depends on teacher	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Assignment info	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Collaboration on documents	3	-1	3.3	-0.5	0	0	1	0	0	0	0	3.0	1	0	0	1	1	0	0	0	3.5	2
Contact information	4	2	3.8	-0.3	0	0	1	2	0	0	0	3.7	3	0	0	0	1	0	0	0	4.0	1
Discussion forums	6	0	4.5	1.7	0	0	1	0	0	1	1	5.3	3	0	0	2	0	1	0	0	3.7	3
Old-school	2	0	3.0	0.0	0	0	1	0	0	0	0	3.0	1	0	0	1	0	0	0	0	3.0	1
Use by others	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
Face-to-face	5	1	4.0	0.0	0	1	1	0	0	0	1	4.0	3	0	0	1	0	1	0	0	4.0	2
Improve	4	0	3.3	-0.5	0	0	2	0	0	0	0	3.0	2	0	0	1	1	0	0	0	3.5	2
It provides opportunities	2	-2	5.5		0	0	0	0	0	0	0		0	0	0	0	0	1	1	0	5.5	2
Other platforms	11	-5	3.6	-0.9	0	1	1	1	0	0	0	3.0	3	0	0	4	2	1	1	0	3.9	8
Prefer Moodle - More Professional	1	1	4.0		0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	0		0
Same as 15	5	-3	4.2	-1.5	0	0	1	0	0	0	0	3.0	1	0	0	1	1	1	1	0	4.5	4
Upload tasks	3	1	3.0	0.0	0	0	2	0	0	0	0	3.0	2	0	0	1	0	0	0	0	3.0	1
Evaluation	10	-4	4.0	-1.0	0	0	2	1	0	0	0	3.3	3	0	0	3	1	1	2	0	4.3	7
Bad	6	-4	3.5	-0.6	0	0	1	0	0	0	0	3.0	1	0	0	3	1	1	0	0	3.6	5
Good	2	0	5.0	-2.0	0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	1	0	6.0	1
Neutral	2	0	4.5	-3.0	0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	1	0	6.0	1
Total (unique)	20	0	4.0	-0.4	0	1	5	2	0	1	1	3.8	10	0	0	4	2	2	2	0	4.2	10

Many people stated in some way that Moodle does not provide features for collaboration or that it is bad, whereas few said that it was good or somewhat neutral. Some recognized that Moodle provides opportunities for collaboration (2), but they are not necessarily used. Multiple people (5) stated that they perceived the

answer to the 16th question being the same as to the previous 15th question about communicativeness.

Discussion forums were mentioned (6). Two stated that discussion forums felt somewhat *"old-school," "blogpost-y,"* and would have preferred instant messaging. One student mentioned that there was not much of a discussion on the forums, but instead, people expressing their opinions, even when responding to others' posts as part of doing assignments. Interestingly, six respondents mentioned group chats or private sections on discussion forums: some stated that they liked using the feature and *"it was really collaborative,"* whereas others stated that they would have liked that feature to appear so that their collaboration would be improved. One informant stated that if the teacher were to create separate sections only visible to group members, then that would be a good tool, but the informant was not sure if it was present or not. Another mentioned that group chats could be improved, especially if there is no possibility to meet other people elsehow, such as in online courses.

Four students stated that they liked Moodle for finding contact information, but then some of these proceeded to use other platforms, such as e-mail or instant messengers. Many people referred to side platforms (11), such as using WhatsApp, Google Drive, or e-mails for collaborating. Face-to-face communication was mentioned several times (5). Some stated that they preferred this type of communication to use Moodle. However, one student mentioned that discussion forums were better than face-to-face communication because the students had separate schedules, and as such, it was easier to collaborate over Moodle. Furthermore, another student stated that communication over Moodle was better because it was formal and because it was not required to share personal contact information, like a telephone number. Three students expressed concern over the lack of possibility to collaborate on the shared documents, similar to that in Google Drive. Thus, many used other platforms like Google Drive and simply uploaded tasks in Moodle. One stated that Moodle helped with collaboration over other methods of communication by providing information about the assignments.

17 – Confidence

Table 28. Quantified data of mentioned topics by respondents for question 17.

Mentioned Topic	17 - Confidence																									
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male												
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Teachers	2	-2	4.5		0	0	0	0	0	0	0		0	0	1	0	0	0	0	1	4.5	2
Teacher_Official Assurance	2	0	6.0	2.0	0	0	0	0	0	0	1	7.0	1	0	0	0	0	1	0	0	5.0	1
Sensitive info for leak	2	0	4.0	-2.0	0	0	1	0	0	0	0	3.0	1	0	0	0	0	1	0	0	5.0	1
Problems with planning	2	2	6.0		0	0	0	0	0	2	0	6.0	2	0	0	0	0	0	0	0		
Non-existent_thru_Moodle	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		
Mandatory communication	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Key to enrol to course	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Formal communication	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		
Express opinions freely	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		
Doesn't know who sees info	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		
Discussion forums	3	1	4.0	0.0	0	0	1	0	1	0	0	4.0	2	0	0	0	1	0	0	0	4.0	1
Because it is for studying	4	-2	5.8	0.3	0	0	0	0	0	1	0	6.0	1	0	0	0	0	1	2	0	5.7	3
Evaluation	15	-1	5.1	0.3	0	0	1	0	3	2	1	5.3	7	0	1	0	1	3	2	1	5.0	8
Bad	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		
Good	14	-2	5.3	0.7	0	0	0	0	3	2	1	5.7	6	0	1	0	1	3	2	1	5.0	8
Neutral	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		
Total (unique)	20	0	5.1	0.3	0	0	2	0	3	4	1	5.2	10	0	1	0	2	4	2	1	4.9	10

The majority of people expressed that they find the confidence quite high when using Moodle, although one person stated that she did not trust using Moodle because she did not know who would see the information posted by her. Some people asked to explain the question, for which the researcher has explained that the question asks to evaluate the confidence and feeling secure when interacting over discussion forums as an example. One commented that technically this confidence over Moodle did not exist since no communication existed in Moodle in the first place due to a small group of 7 people instead of 100 people and the prevalence of personal communication.

Four stated that they trusted communication in Moodle because they believed that Moodle is a university-based platform and that most of the users are students – those who are supposed to be enrolled in the university. Two stated that assurance by the teacher or by the official employee from the university that the communication and the use of Moodle are secure had elevated the students' confidence. Three stated that they trusted interactions over Moodle to be secure. One said, *"I have not interacted with anyone but teachers, so it's not like a social media in that way."* Another mentioned that he believed that only the teacher would see the information. Some mentioned that they felt that there was a potential for leakage of information. One stated, *"the info that is on Moodle about me – my name, my Åbo Akademi e-mail address – that would not be a big deal."* Simultaneously, another person, the one who did not feel secure, stated that she felt the grades was sensitive information, but she could easily share her assignments without feeling threatened.

Finally, one stated that there was formal communication, which added to the confidence. Another stated that there was too much mandatory communication as part of having to discuss assignments there. Thus, communication did not feel real. By having to have a key to enroll to the course was mentioned to have the potential to increase the confidence in the safe communication on Moodle. One stated that opinions could have been expressed freely over Moodle. Two mentioned that the problems with confidence came not from the security, but from that, these students were not sure when others would reply. Moreover, as such, it was hard to plan how the discussions of assignments would proceed, often leading to the last-minute discussions before the deadlines set up by the teacher.

18 – Attentiveness

Table 29. Quantified data of mentioned topics by respondents for question 18.

Mentioned Topic	18 - Attentiveness																						
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male									
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Depends on student	2	-2	4.0		0	0	0	0	0	0	0		0	0	0	1	0	1	0	0	4.0	2
Direct messages_Chat	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Discussion forums	3	1	5.3	2.0	0	0	0	0	1	0	1	6.0	2	0	0	0	1	0	0	0	4.0	1
Expects from other channels first	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Impersonal	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Improve	5	-3	4.4	0.8	0	0	0	0	1	0	0	5.0	1	0	0	0	3	1	0	0	4.3	4
Interactivity	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Mobile app	2	0	4.5	1.0	0	0	0	0	1	0	0	5.0	1	0	0	0	1	0	0	0	4.0	1
Read study content in advance	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Teacher	4	0	4.0	1.0	0	0	1	0	0	1	0	4.5	2	0	0	1	1	0	0	0	3.5	2
Email notification	11	1	5.0	0.7	0	0	1	0	2	2	1	5.3	6	0	0	1	1	2	1	0	4.6	5
Filter notifications	2	-2	4.5		0	0	0	0	0	0	0		0	0	0	0	1	1	0	0	4.5	2
Randomness	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Too much_Too annoying	6	-2	4.7	0.5	0	0	0	0	2	0	0	5.0	2	0	0	1	1	1	1	0	4.5	4
Types of interaction with info	7	1	5.0	1.2	0	0	1	0	0	2	1	5.5	4	0	0	1	1	0	1	0	4.3	3
Reading only relevant	6	0	4.8	1.0	0	0	1	0	0	1	1	5.3	3	0	0	1	1	0	1	0	4.3	3
Reading_Not responding	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Evaluation	7	-1	4.4	-0.2	0	0	1	0	2	0	0	4.3	3	0	0	0	2	2	0	0	4.5	4
Bad	3	-1	4.0	-1.5	0	0	1	0	0	0	0	3.0	1	0	0	0	1	1	0	0	4.5	2
Good	3	1	4.7	1.0	0	0	0	0	2	0	0	5.0	2	0	0	0	1	0	0	0	4.0	1
Neutral	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Total (unique)	20	0	4.8	0.5	0	0	2	0	5	2	1	5.0	10	0	0	1	4	4	1	0	4.5	10

Some students evaluated attentiveness as good or relatively high. Some students stated that they considered attentiveness of Moodle to be bad or relatively low, and one stated that it is somewhat neutral. For the most part, many students (11) spoke about e-mail notifications that they received when someone posted something in Moodle, be it a teacher or a student, in different places – a discussion forum, a chat, or a notification from the teacher. One student mentioned a certain degree of randomness: *"sometimes you get e-mails that are relevant, sometimes you do not, and sometimes you get e-mails every time and that's very annoying."* As a matter of fact, six students stated that sometimes they got too much irrelevant to them notifications, and for some, it was annoying. For the most part, students were found to try only to read posts that were relevant to them (6), ignoring irrelevant ones. However, one student stated that he was reading all of the e-mails, but not responding to them. Two stated that filter notifications would have helped with the situation.

Four mentioned teachers in their responses, and as such, the types of attentiveness are different for the teachers than for the students. One student stated that she becomes attentive to the information if the teacher states that it is compulsory to discuss as part of an assignment on the discussion forums. Another stated that he did not always receive info from the teacher, but only from the students. For one, attentiveness of Moodle was useful, because through Moodle, a teacher was able to reschedule the course. Finally, one rated attentiveness very low since she felt that it was only her and the teacher communicating on Moodle. Multiple other students stated that the main attentiveness they got from others was when other students were discussing something over Moodle in the discussion forums.

Two stated that they would have preferred some sort of mobile app to improve the attentiveness of Moodle. Two mentioned that attentiveness depends on themselves

as students and how they use an LMS. One said that he expects the information to come from other channels first, rather than from Moodle, such as from messengers, for another attentiveness was good because it was possible to read the course content in advance before the lecture. For one to improve attentiveness, it was better if there were more interactive ways of discussing via the Moodle. The ability to send direct messages in Moodle was found helpful for making one attentive to others by one informant.

19 – Responsiveness

Table 30. Quantified data of mentioned topics by respondents for question 19.

	19 - Responsiveness																						
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male									
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Depends on user	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Commenting on others	3	-3	5.7		0	0	0	0	0	0	0		0	0	0	0	0	1	2	0	5.7	3
Direct messaging_Chat	4	0	5.0	-2.0	0	0	1	0	1	0	0	4.0	2	0	0	0	0	0	2	0	6.0	2
Allows for hiding sensitive info	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Features	5	-1	4.2	0.5	0	0	0	1	1	0	0	4.5	2	0	0	2	0	0	1	0	4.0	3
Discussion forums	3	1	5.0	-1.5	0	0	0	1	1	0	0	4.5	2	0	0	0	0	0	1	0	6.0	1
Grades	2	-2	3.0		0	0	0	0	0	0	0		0	0	0	2	0	0	0	0	3.0	2
Wiki	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Improve	3	1	4.7	-2.0	0	0	1	0	1	0	0	4.0	2	0	0	0	0	0	1	0	6.0	1
Mobile app	2	2	4.0		0	0	1	0	1	0	0	4.0	2	0	0	0	0	0	0	0		0
Other platforms	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Randomness in responses	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Responding to information	8	0	5.1	0.3	0	0	0	2	0	1	1	5.3	4	0	0	1	0	1	2	0	5.0	4
Acknowledging info	2	2	5.5		0	0	0	1	0	0	1	5.5	2	0	0	0	0	0	0	0		0
Always answer to another person	2	0	5.5	1.0	0	0	0	0	0	1	0	6.0	1	0	0	0	0	1	0	0	5.0	1
Have to respond	5	1	5.2	-1.3	0	0	0	2	0	1	0	4.7	3	0	0	0	0	0	2	0	6.0	2
Not responding	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Only relevant information	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Teacher's engagement	2	0	6.0	2.0	0	0	0	0	0	0	1	7.0	1	0	0	0	0	1	0	0	5.0	1
There are mechanisms for it	3	-1	5.0	-3.0	0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	2	0	6.0	2
Evaluation	7	1	4.7	-0.5	0	0	2	0	1	0	1	4.5	4	0	0	1	0	0	2	0	5.0	3
Bad	2	0	3.0	0.0	0	0	1	0	0	0	0	3.0	1	0	0	1	0	0	0	0	3.0	1
Good	4	0	6.0	0.0	0	0	0	0	1	0	1	6.0	2	0	0	0	0	0	2	0	6.0	2
Neutral	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
Total (unique)	19	-1	4.9	-0.1	0	0	2	2	2	1	2	4.9	9	0	0	2	1	2	5	0	5.0	10

The responsiveness of Moodle was described as somewhat good for certain reasons, although there were found certain issues. Three admitted that there are mechanisms for responding to others, but sometimes these were thought as not being used. Many people spoke about previously discussed in the 18th question feature of notifications. Ten students spoke about methods of responding to information. Five mentioned that they sometimes responded to the information because they have had to. Two simply acknowledged information without responding. Two stated that they always answer to another person. One stated that he was not responding at all, whereas another mentioned that he is interested only in information that is relevant to him.

Different features were discussed in terms of what features are related to responsiveness in Moodle: discussion forums (3), grades (2), and wiki (1). Three mentioned commenting on others as a method of responsiveness in Moodle. Direct

messaging or chat function was also mentioned – some said that this feature is not present, whereas others stated that they did not observe the function working correctly. The main reason for wanting the feature of chat or direct messaging was that it would allow for sending information that the user would not have liked to be observed by others.

Two proposed to make a mobile app since that would have allowed to check and respond better over mobile version than over PC, which is not always accessible. One mentioned randomness in responsiveness due to not always receiving notifications about new information. The teacher was mentioned either as increasing responsiveness by engaging students to discuss or as the person who could explain how to use Moodle better for responding to others. One stated that responsiveness depends on how users are using Moodle.

20 – Helpfulness

Table 31. Quantified data of mentioned topics by respondents for question 20.

	20 - Helpfulness																									
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male												
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Allows to help	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Ask for help	4	2	4.3	3.0	0	0	0	1	1	1	0	5.0	3	0	1	0	0	0	0	0	2.0	1
Depends on the course	2	-2	3.5		0	0	0	0	0	0	0		0	0	1	0	0	1	0	0	3.5	2
Discussion forums	4	0	5.8	1.5	0	0	0	0	0	1	1	6.5	2	0	0	0	0	2	0	0	5.0	2
Doesn't allow to help	1	1	5.0		0	0	0	0	1	0	0	5.0	1	0	0	0	0	0	0	0		0
Exotic types of content (formulas, drawing)	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Extra articles	2	2	4.5		0	0	1	0	0	1	0	4.5	2	0	0	0	0	0	0	0		0
Feature to post extra articles by students	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
Info posted by others	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Improve	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Helps	2	0	4.0	4.0	0	0	0	0	0	1	0	6.0	1	0	1	0	0	0	0	0	2.0	1
Interpersonal communication	2	-2	3.0		0	0	0	0	0	0	0		0	0	1	0	1	0	0	0	3.0	2
Not suitable for some questions	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Other platforms	5	3	5.4	-0.8	0	0	0	1	1	2	0	5.3	4	0	0	0	0	0	1	0	6.0	1
Send assignment	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Students	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Tasks_Deadlines	1	-1	3.0		0	0	0	0	0	0	0		0	0	0	1	0	0	0	0	3.0	1
Teacher	5	-1	4.8	1.2	0	0	0	0	1	1	0	5.5	2	0	1	0	0	1	1	0	4.3	3
Teacher's engagement	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Evaluation	8	0	4.5	2.5	0	0	0	0	2	1	1	5.8	4	0	1	2	0	1	0	0	3.3	4
Bad	2	0	4.0	2.0	0	0	0	0	1	0	0	5.0	1	0	0	1	0	0	0	0	3.0	1
Good	5	-1	4.4	2.7	0	0	0	0	1	0	1	6.0	2	0	1	1	0	1	0	0	3.3	3
Neutral	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Total (unique)	20	0	4.8	1.3	0	0	1	1	3	3	2	5.4	10	0	2	2	1	3	2	0	4.1	10

Informants spoke of many issues that were mentioned only by one or a few other students. Two stated that helpfulness depends on the course. One said that Moodle provides possibilities to help, whereas another student said that Moodle does not help at all. Some people mentioned that they or someone else could have used Moodle to reach out for help. One student has characterized discussion forums as the most helpful part of Moodle. Another stated that it would have been more helpful if students, when asking for help from the teacher, used discussion forums that are visible for everyone, instead of sending e-mails that are only visible to the teacher.

Five students mentioned other platforms when answering. Some said that they would prefer to seek help by using other platforms. Two mentioned extra articles posted by teachers, but also by other students as being helpful to them. Additionally, information posted by others was helpful. Personal communication was preferred by two students for some issues. One stated that Moodle was not suitable for discussing some questions, like drawing mathematical formulas. Deadlines in Moodle were mentioned to be helpful. Helpfulness was also mentioned to be different if the communication is with students or with teachers.

21 – Respectfulness

Table 32. Quantified data of mentioned topics by respondents for question 21.

	21 - Respectfulness																						
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male									
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Because university_Work-related	4	2	5.8	2.3	0	0	0	0	1	0	2	6.3	3	0	0	0	1	0	0	0	4.0	1
Formal_Official	5	1	6.8	0.5	0	0	0	0	0	0	3	7.0	3	0	0	0	0	0	1	1	6.5	2
Not much communication	1	1	3.0		0	0	1	0	0	0	0	3.0	1	0	0	0	0	0	0	0		0
Other platforms	4	2	6.0	-1.3	0	0	1	0	0	0	2	5.7	3	0	0	0	0	0	0	1	7.0	1
Small university	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Issues with other people	5	-1	6.0	0.8	0	0	0	0	0	1	1	6.5	2	0	0	0	0	1	2	0	5.7	3
Hidden tension in arguments	3	-1	6.0	0.0	0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	2	0	6.0	2
Misunderstanding other's POV	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Personality issues	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Problems with post timing	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Evaluation	17	1	5.8	1.1	0	0	0	0	2	2	5	6.3	9	0	0	0	3	1	3	1	5.3	8
Neutral	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0
Not respectful	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0
Respectful	17	1	5.8	1.1	0	0	0	0	2	2	5	6.3	9	0	0	0	3	1	3	1	5.3	8
Total (unique)	18	2	5.7	0.8	0	0	1	0	2	2	5	6.0	10	0	0	0	3	1	3	1	5.3	8

Overall, 17 people have stated that communication has been respectful in Moodle, most of whom stated that they had not seen any issues in that regard. One expressed doubt when ranking because she said that she did not experience much communication over Moodle. Four stated that communication over Moodle is respectful because it was the university's platform. Five classified communication in Moodle as formal and official. One said that Moodle is a small university, and thus the communication must be respectful.

However, there were noted some other issues when communicating with others. Two said that there was some hidden tension when arguing with others over the Moodle; some feelings of irritation, annoyance, and anger were felt. One stated that the nature of the tension came from being dependent on the good feedback and agreement since that might have affected the grade. At the same time, one said that even though there were some arguments, they agreed to disagree, and thus, there was no tension. Some other informants, when asked whether they experienced similar tensions in discussions, stated that they did not. One mentioned that there were certain issues with others' personalities, shown in the difficulties of communicating efficiently. Potential difficulties in understanding each other's point of view were also mentioned (1). Finally, one stated that there were some issues

with the timing of posts – such as difficulties of engaging in an effective discussion because the discussion has already ended.

22 – Convincingness

Table 33. Quantified data of mentioned topics by respondents for question 22.

Mentioned Topic	22 - Convincingness																					
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male								
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
As a student - yes	14	2	6.1	-0.3	0	0	1	1	0	1	5	6.0	8	0	0	0	0	1	2	3	6.3	6
Have to use	7	1	6.1	-0.9	0	0	1	0	0	1	2	5.8	4	0	0	0	0	0	1	2	6.7	3
Use after graduation	8	4	6.3	-0.3	0	0	1	0	0	1	4	6.2	6	0	0	0	0	0	1	1	6.5	2
May be	5	1	6.8	0.5	0	0	0	0	0	0	3	7.0	3	0	0	0	0	0	1	1	6.5	2
No	3	3	5.3		0	0	1	0	0	1	1	5.3	3	0	0	0	0	0	0	0		0
Yes	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0
Evaluation	20	0	6.1	0.1	0	0	1	1	0	2	6	6.1	10	0	0	0	0	3	4	3	6.0	10
Maybe	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0
No	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0
Yes	20	0	6.1	0.1	0	0	1	1	0	2	6	6.1	10	0	0	0	0	3	4	3	6.0	10
Total (unique)	20	0	6.1	0.1	0	0	1	1	0	2	6	6.1	10	0	0	0	0	3	4	3	6.0	10

All of the students stated that they are convinced that they will use Moodle as part of their studies. Many stated that they would use it as long as they are students, but after graduation, they would continue using Moodle only if it is part of their studies or part of their work. Five said that they might be using Moodle after graduation, whereas three stated that they would not use Moodle after graduation. One mentioned that it was not possible to use Moodle anyway, since, after graduation as a student, the access is lost. Seven mentioned that they are convinced because they have to use it – either because everyone around them uses it, or because the teacher demands them to use it. One said that she was convinced of using Moodle since all of the courses are e-courses, which are only available in Moodle.

23 – Willingness

Table 34. Quantified data of mentioned topics by respondents for question 23.

Mentioned Topic	23 - Willingness																									
	Total Num. of Resp.	Diff. in Num. of Resp. (f-m)	Total Mean Score	Difference in mean scores (f-m)	Female									Male												
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
Depends on tiredness_Emo. state	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Depends on willingness to learn	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Discussion forums	1	1	1.0		1	0	0	0	0	0	0	1.0	1	0	0	0	0	0	0	0		0
Extra learning	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Facilitates studying	2	-2	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	2	0	6.0	2
Familiar_Easy to use	5	-3	6.2	1.0	0	0	0	0	0	0	1	7.0	1	0	0	0	0	1	2	1	6.0	4
If have to	6	-2	5.2	-4.0	1	0	0	1	0	0	0	2.5	2	0	0	0	0	0	2	2	6.5	4
Improve	2	-2	5.5		0	0	0	0	0	0	0		0	0	0	0	0	1	1	0	5.5	2
It is work-studies	9	1	5.9	-1.1	0	0	0	1	1	3	0	5.4	5	0	0	0	0	0	2	2	6.5	4
Mobile app	1	-1	5.0		0	0	0	0	0	0	0		0	0	0	0	0	1	0	0	5.0	1
Only choice_Only tool	2	0	6.5	-1.0	0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	1	7.0	1
Open access (not students only)	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Other platforms	2	2	4.0		0	0	0	2	0	0	0	4.0	2	0	0	0	0	0	0	0		0
Evaluation	16	-2	5.7	-1.2	1	0	0	2	0	2	2	5.0	7	0	0	0	0	1	5	3	6.2	9
Neutral	5	1	4.8	-2.8	1	0	0	1	0	1	0	3.7	3	0	0	0	0	0	1	1	6.5	2
Not Willing	2	0	5.5	-3.0	0	0	0	1	0	0	0	4.0	1	0	0	0	0	0	0	1	7.0	1
Willing	9	-3	6.2	0.7	0	0	0	0	0	1	2	6.7	3	0	0	0	0	1	4	1	6.0	6
Total (unique)	20	0	5.6	-1.1	1	0	0	3	1	3	2	5.0	10	0	0	0	0	2	5	3	6.1	10

Some students state that they are willing to use Moodle (9), some stated that they are somehow neutral (5), and some stated that they are not willing to use Moodle (2). However, many respondents state that they are willing to use Moodle from the point of view as a tool for studying, which has a utilitarian use. The researcher has inquired some of the informants whether the willingness is the same or different to other platforms, such as YouTube, and the response was that the willingness to use is different because the purpose is different (entertainment instead of studying). Additionally, one respondent stated that the purpose of using YouTube is different (more passive information consumption) than the purpose of using Moodle (more active work with the information).

As such, 9 students stated that Moodle is for studies or for work. Six continued that they will use Moodle if they have to, but some of them explained do not have any problem with using Moodle. Five mentioned their willingness to use Moodle in the context of its easiness or familiarity. Two others stated that Moodle could facilitate studying; hence they might be willing to use Moodle. Two stated that it is the only tool or choice that they have to use. Two mentioned other platforms. One mentioned, *"I think if people wanted to learn, then they would go to Udemy or some other learning platform."* Another mentioned an LMS that was on his exchange that was clearer and more structured.

One mentioned that willingness to use Moodle depends on the willingness to study. Another stated that willingness to use Moodle depends on the tiredness or emotional state of the student. One stated that if there were a mobile app, he would have had a higher willingness to use Moodle. One mentioned that he would go on Moodle to browse for reading extra material in which he is interested. However, he also mentioned that there are some courses that require being enrolled, and as such, proposed an improvement idea that if the courses were open to non-students, he would have been more willing to use Moodle.

24 – Recommend

Table 35. Quantified data of mentioned topics by respondents for question 24.

	24 - Recommend																									
Mentioned Topic	**Total Num. of Resp.**	**Diff. in Num. of Resp. (f-m)**	**Total Mean Score**	**Difference in mean scores (f-m)**	Female									Male												
					1	2	3	4	5	6	7	Mean Score	Num. of Resp.	1	2	3	4	5	6	7	Mean Score	Num. of Resp.
No other LMS (hrd to compre)	5	-3	5.8	0.3	0	0	0	0	0	1	0	6.0	1	0	0	0	1	0	2	1	5.8	4
Other LMS	6	0	5.7	1.3	0	0	0	0	1	0	2	6.3	3	0	0	0	1	1	1	0	5.0	3
Would recommend for	17	1	5.6	0.0	1	0	0	0	1	4	3	5.7	9	0	0	0	2	0	5	1	5.6	8
Basic functionality	2	2	3.5		1	0	0	0	0	1	0	3.5	2	0	0	0	0	0	0	0		0
Clear structure	2	2	7.0		0	0	0	0	0	0	2	7.0	2	0	0	0	0	0	0	0		0
Design	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Easy for teachers to administrate	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Easy to receive info from teacher	3	1	6.3	-1.0	0	0	0	0	0	2	0	6.0	2	0	0	0	0	0	0	1	7.0	1
Easy to send tasks	4	-2	5.3	-0.3	0	0	0	0	1	0	0	5.0	1	0	0	0	1	0	2	0	5.3	3
Easy to use	7	-1	5.6	1.3	0	0	0	0	0	2	1	6.3	3	0	0	0	2	0	2	0	5.0	4
Efficient to use	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Facilitates studying	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Information in the same place	5	3	5.8	2.3	0	0	0	0	1	1	2	6.3	4	0	0	0	1	0	0	0	4.0	1
Monitor the process	1	1	7.0		0	0	0	0	0	0	1	7.0	1	0	0	0	0	0	0	0		0
Wouldn't recommend for	17	-3	5.5	-0.3	1	0	0	0	1	4	1	5.3	7	0	0	0	2	1	6	1	5.6	10
Communication	5	1	5.8	-0.3	0	0	0	0	1	2	0	5.7	3	0	0	0	0	0	2	0	6.0	2
course enrollment	3	1	5.7	1.0	0	0	0	0	1	0	1	6.0	2	0	0	0	0	1	0	0	5.0	1
Course list - clearer	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Customizeability of front page	1	-1	7.0		0	0	0	0	0	0	0		0	0	0	0	0	0	0	1	7.0	1
Different teachers - use differently	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Discussion forums	2	0	5.0	2.0	0	0	0	0	0	1	0	6.0	1	0	0	0	1	0	0	0	4.0	1
Email notifications from teacher (when upload)	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Layout_UI	3	-1	5.3	-0.5	0	0	0	0	1	0	0	5.0	1	0	0	0	0	1	1	0	5.5	2
More user-friendly	3	-1	4.7	-5.5	1	0	0	0	0	0	0	1.0	1	0	0	0	0	0	1	1	6.5	2
Navigation	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
No mobile app	1	1	6.0		0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	0	0		0
Open access to courses	1	-1	6.0		0	0	0	0	0	0	0		0	0	0	0	0	0	1	0	6.0	1
Technical stuff - optimize	1	-1	4.0		0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	4.0	1
Usability issues	2	0	6.0	0.0	0	0	0	0	0	1	0	6.0	1	0	0	0	0	0	1	0	6.0	1
Evaluation	15	1	5.5	0.3	1	0	0	0	1	3	3	5.6	8	0	0	0	2	1	4	0	5.3	7
Neutral	3	3	4.3		1	0	0	0	1	0	1	4.3	3	0	0	0	0	0	0	0		0
Not recommend	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	0		0
Recommend	12	-2	5.8	1.1	0	0	0	0	0	3	2	6.4	5	0	0	0	2	1	4	0	5.3	7
Total (unique)	20	0	5.7	0.1	1	0	0	0	1	5	3	5.7	10	0	0	0	2	1	6	1	5.6	10

Most people recommended Moodle to be used for different reasons, whereas some were neutral. Six mentioned evaluation of how much they would recommend Moodle to be used in the context of other LMS that they have used in the past. Five comment their answers that they have not used other LMS, sometimes stating that there might be other better options. Occasionally the researcher has asked to elaborate on the interviewers' answers to the reasons based on which they would and would not recommend Moodle.

Students mentioned that they would recommend Moodle because it is easy to use (7), all relevant information is placed conveniently in the same place (5), easy to send tasks to the teacher for evaluation (4), easy to receive information from the teacher (3). There were also less frequent mentions: that Moodle has a clear

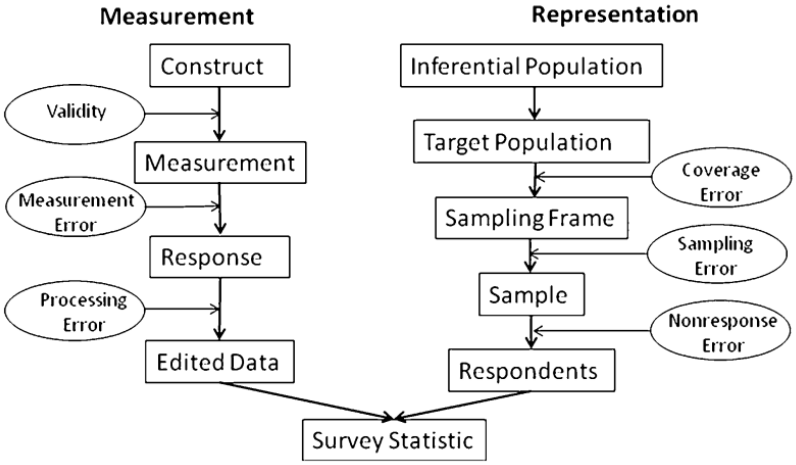
structure (2), offers basic functionality (2), it is efficient to use (1), easy for teachers to administer Moodle (1), that in Moodle it is possible to monitor the studying process (1), that Moodle facilitates studying (1) and that the design is liked (1).

Several students would not recommend or suggest to improve before being able to recommend these things: communication in Moodle, including group communication (5), user-friendliness of Moodle (3), hard to locate and use course enrollment (3), Layout or UI (3), discussion forums (2), usability issues (2). Additionally, there were specific topics that were mentioned by single respondents: lack of customizability of the front page, lack of mobile app, navigation of Moodle. Furthermore, some stated that they would have liked to make the course list clearer, to optimize technical stuff, to provide open access for non-enrolled students to some courses, and to provide instant notifications when teachers post something.

4.3. Verification of the results

Groves and Lyberg (2010) define Total Survey Error (TSE) as a conceptual framework describing the statistical error properties of sample survey statistics, which incorporates a variety of error sources. Groves et al. (2011, p. 34) state that the Total Survey Error (TSE) approach means taking into account a broad perspective and making sure that no feature of the survey is designed in such a way that it undermines the ability of the survey to accomplish its goals. Biemer (2010, p. 817-818) states: *"Total survey error (TSE) refers to the accumulation of all errors that may arise in the design, collection, processing, and analysis of survey data. In this context, a survey error is defined as the deviation of a survey response from its true underlying value. A related term—survey accuracy—is defined as the deviation of a survey estimate from its underlying true parameter value. Survey errors can arise from the survey frame deficiencies, the sampling process, interviewing and interviewers, respondents, missing data, and coding, keying, and editing processes. Survey error is problematic because it diminishes the accuracy of inferences derived from the survey data. A survey estimator will be accurate if it has a small bias and variance, which occurs only if the influence of TSE on the estimate is small."* Groves et al. (2004) present Total Survey Error Components Linked to Steps in the Measurement and Representational Inference Process (Figure 20). TSE is hence used in contemporary research as a way to verify the results, which are based on surveying and interviewing users. Survey Statistic is understood in this study as any data coming from the respondent – qualitative or quantitative.

Figure 20. Total Survey Error Components Linked to Steps in the Measurement and Representational Inference Process



Source: Groves et al. (2004)

Inferential Population is "Students using a Learning Management System (LMS)." Inferential Population may be somewhat hard to name, given that the concept of UX of an LMS may exist at several levels. For example, UX of an LMS may exist for students in universities, or for users who are not enrolled as students in the university, but who are studying, nevertheless. Target Population is more specific, which is "enrolled students who are using Moodle at an Åbo Akademi University in Turku, Finland."

Coverage Error in TSE is understood as the duplication of collecting surveys several times from the same respondents (overcoverage) or from omitting respondents with certain characteristics from the sample (undercoverage), hence changing the results of the data. The researcher has interviewed those students, who were not interviewed before by remembering the faces of the respondents. Some previously interviewed respondents were approached by the interviewer, but these respondents reminded that they were interviewed before. Respondents were also inquired whether they were currently enrolled as students of Åbo Akademi University, and those who were not were excused from being interviewed. Overcoverage may come only from the fact that certain respondents with certain characteristics may be overrepresented (for example, students with a major in Business). To this, undercoverage is more potentially troubling.

Undercoverage is potentially more present, given that there are several thousands of students at the Åbo Akademi University, while only 20 students were interviewed in a sample. In order to address the issue to some extent, extra data about respondents was collected so as to be able to understand whether there is some potential undercoverage. In the sample, there are no Ph.D. students, and the study majors are not equally distributed, with some being less mentioned than others. Additionally, the respondents were approached physically at two of the several campuses of Åbo Akademi University in Turku. Some students may have been abroad from the country, studying remotely or being present at other campuses. Hence, undercoverage may represent among the biggest threats to the validity of the results, which is partly due to the qualitative-driven methodology.

Sampling Error is another potentially troublesome threat to the validity and reliability of the results. Given that the sampling method is convenience sampling, which is a method to choose participants who are available and easy to find, there is potential towards bias, the more the variation in the population (Saunders et al., 2009, p. 241). Variation in the population may be significant, and thus the results may not accurately represent the variation. Convenience sampling may have contributed to both the Coverage and Sampling Errors.

Non-response Error is estimated by calculating the number of respondents who refused the interviewing. There were 71.14% of respondents out of the total who agreed to be interviewed. As a result, roughly 29% of the respondents did not respond, potentially contributing to the non-response bias. The main reason for non-response was that the respondents did not have enough time for the interview at the time of approach. Non-response bias has the main risk of omitting respondents with specific characteristics that may not have been included in the data analysis results, hence potentially jeopardizing the validity and reliability of the results.

Validity, which is a measure describing the potential error between Construct and Measurement, is primarily based on the validity of the holistic UX model as devised by Topolewski et al. (2019), which is applied in a different context (LMS instead of a mobile feedback-collecting app). RQ3, more or less, makes an attempt at evaluating the Validity – how well the model can be applied to measure the UX. Holistic UX model is found to measure UX of an LMS broadly. Since UX is a concept that is holistic, fuzzy, and hard-to-define, the model has a slight lack of focus on the specific elements of the UX, which is expected.

Measurement Error is a measure between Measurement and elicited Responses from the respondents. This error is primarily based on the respondents' understanding of the questions, the potential bias of the researcher on the respondents' answers, and how the respondents have managed to communicate their thoughts in the interview and survey. In order to address the Measurement Error, there are certain actions taken by the researcher in the process of data collection and data analysis. In particular, answers inconsistency in the responses were evaluated by the researcher, which is described in detail below. Summarizing the results in advance, one shall expect roughly 70% of consistent data (i.e., qualitative and quantitative data that is not contradicting each other greatly). Additionally, the researcher has taken an active approach in trying to explain and facilitate the understanding of the questions by the respondents by explaining and elaborating on the questions asked. However, as Sanders (2002) put, there are several levels of what people say, do, and make, going from explicit to latent needs. It is likely that interviewing as a methodology was able to scratch the surface – what people say. Some respondents stated that they were in a hurry, while others stated they had changed some answers after reflection. As a result, the Measurement Error may have been affected significantly by the topic of research, which is trying to analyze a construct of UX, which is highly subjective in itself. Data results thus may have been at the surficial level of what people say, as well as their explicit needs.

During the data collection stage, the researcher made sure that the questionnaire was filled by the respondent properly without double-marking or missing questions. Occasionally, if that happened, the respondent was asked to fix the mistake. This has happened several times at the stage of data collection. Additionally, the researcher has verified from time to time the consistency of the quantitative data with qualitative data (i.e., words of the interviewer). Not all of the inconsistencies were noticed by the researcher, nor is it claimed that they exist since the researcher's subjective judgment was used to see if the words differed from the quantitative score. When the inconsistency was noticed, the interviewer has asked a question for why such an inconsistency might exist. As a result, six respondents were asked for the reasons for such potential inconsistency. There were several reasons for why participants might have given a differing quantitative score than what was a qualitative comment. Five said that the answer might have changed after the reflection. One stated that he has ranked slightly lower in the context of respectful communication because even though he did not observe the disrespect, he suspected that disrespect might exist somewhere. Another stated that for him, it is quite hard to put a perfect 7, even if there are no issues, since *"that's how people are generally,"* in addition to having the time for reflections that changed the score. One student admitted that she was in a hurry and did not answer thoughtfully when ranking 22nd, 23^{rd,} and 24th questions, even though she said in the interview that the answer score is "high," and as such quantitative scores could be increased. The researcher has increased the grades from 2 to 6 for that student as a result of that feedback. For other inconsistencies, the researcher has not taken adjustments since the respondents did not state that the score could be increased. Furthermore, the evaluation of inconsistencies was not a part of the methodology, and as such, was not expected and could not be considered systematic for all of the responses. Finally, two stated that wording of the questions and as such meaning associated could have changed the understanding in the informants' minds of what was being evaluated, thus changing the score.

The researcher has coded the qualitative responses by informants into three evaluation codes for each of the UX property questions: positive/good, neutral, and negative/bad. Before inputting these values into the common table, the researcher has verified that there was no double-coding of the same response in two different qualitative evaluation categories. These evaluation categories were then compared with quantitative responses to estimate the degree of potential inconsistency. In order to determine whether an answer was inconsistent or not, the researcher has counted if a corresponding attribute was given a score 1, 2, or 3 for the code negative/bad; 4 for the code neutral; 5, 6, or 7 for the code positive/good. The table for visualization purposes is represented below (Table 36).

Table 36. Qualitative evaluation coded by the researcher and the corresponding consistent quantitative score.

Qualitative Evaluation coded by the researcher	Consistent Quantitative Score
Good/Positive	5, 6, 7
Neutral	4
Bad/Negative	1, 2, 3

For example, if the respondent stated that he believed the UX property was bad while giving 4, 5, 6, or 7 – the answer was considered to be inconsistent. It is important to underline that the results of whether an answer was or was not consistent are significantly dependent on the researcher's judgment of how to code the answer qualitatively. In general, however, the answers were coded according to the mentioned semantic meanings of the respondents (e.g., explicitly mentioning that the UX property was *"Good"* or that *"there were no problems,"* hence the UX property being coded as being positive). Total answers and consistent answers were calculated for each individual UX property and the share of consistent answers calculated as the consistent answers divided by the total answers. UX facets and UX dimensions were calculated in a similar manner – the sum of all consistent UX properties that make up the UX facet or UX dimension were divided by the sum of total answers of the respective UX properties. Average consistency is calculated in the low part of the table by dividing the sum of all consistent answers by the sum of all total answers for all of the UX properties. Results of the consistency evaluation may be seen below in Table 37 that analyzes the consistency for Female and Male, and in Table 38, that analyzes the total consistency between the two genders, as well as the difference between the shares of consistent answers.

Table 37. Comparison of consistency of answers for Females and Males across UX properties, facets, and dimensions.

UX Dimension	UX Facet	UX Property	Female						Male					
			Total Answers	Consistent Answers	Inconsistent Answers	Share of Consistent Answers (UX Property)	Share of Consistent Answers (UX Facet)	Share of Consistent Answers (UX Dimen.)	Total Answers	Consistent Answers	Inconsistent Answers	Share of Consistent Answers (UX Property)	Share of Consistent Answers (UX Facet)	Share of Consistent Answers (UX Dimen.)
Business	Economical	*1 - Usefulness*	9	7	2	77.8%	64.9%	64.4%	8	8	0	100.0%	91.2%	78.1%
		2 - Pleasantness	9	6	3	66.7%			8	5	3	62.5%		
		3 - Entertaining	9	3	6	33.3%			9	9	0	100.0%		
		4 - Productivity	10	8	2	80.0%			9	9	0	100.0%		
	Technological	*5 - Novelty*	8	5	3	62.5%	63.9%		9	4	5	44.4%	66.7%	
		6 - Reliability	10	7	3	70.0%			10	9	1	90.0%		
		7 - Efficiency	8	8	0	100.0%			10	9	1	90.0%		
		8 - User-friendliness	10	3	7	30.0%			10	4	6	40.0%		
Human	Emotional	*9 - Attractiveness*	10	4	6	40.0%	60.7%	64.0%	10	8	2	80.0%	70.4%	76.6%
		10 - Enjoyment	9	6	3	66.7%			10	7	3	70.0%		
		11 - Fulfillness	9	7	2	77.8%			7	4	3	57.1%		
	Cognitive	*12 - Comprehensiveness*	8	4	4	50.0%	68.2%		6	5	1	83.3%	85.0%	
		13 - Meaningfulness	7	6	1	85.7%			8	6	2	75.0%		
		14 - Engagement	7	5	2	71.4%			6	6	0	100.0%		
Social	Interpersonal	*15 - Communicativeness*	6	2	4	33.3%	62.5%	75.0%	3	1	2	33.3%	61.1%	56.8%
		16 - Collaborativeness	3	1	2	33.3%			7	4	3	57.1%		
		17 - Confidence	7	7	0	100.0%			8	6	2	75.0%		
	Empathical	*18 - Attentiveness*	3	3	0	100.0%	85.0%		4	0	4	0.0%	52.6%	
		19 - Responsiveness	4	3	1	75.0%			3	3	0	100.0%		
		20 - Helpfulness	4	2	2	50.0%			4	2	2	50.0%		
		21 - Respectfulness	9	9	0	100.0%			8	5	3	62.5%		
Intention to use		*22 - Convincingness*	10	8	2	80.0%	68.0%		10	10	0	100.0%	80.8%	
		23 - Willingness	7	4	3	57.1%			9	6	3	66.7%		
		24 - Recommend	8	5	3	62.5%			7	5	2	71.4%		
		Average Consistency	184	123	61	**66.8%**			183	135	48	**73.8%**		

Table 38. Comparison of consistency of answers for all respondents across UX properties, facets, and dimensions.

UX Dimension	UX Facet	UX Property	Total							
			Total Answers	Consistent Answers	Share of Consistent Answers (UX Property)	Share of Consistent Answers (UX Facet)	Share of Consistent Answers (UX Dimen.)	Difference in Consistency of UX property (f-m)	Difference in Consistency of UX facet (f-m)	Difference in Consistency of UX dimens. (f-m)
Business	Economical	*1 - Usefulness*	17	15	88.2%	77.5%	71.2%	-22.2%	-26.3%	-13.7%
		2 - Pleasantness	17	11	64.7%			4.2%		
		3 - Entertaining	18	12	66.7%			-66.7%		
		4 - Productivity	19	17	89.5%			-20.0%		
	Technological	*5 - Novelty*	17	9	52.9%	65.3%		18.1%	-2.8%	
		6 - Reliability	20	16	80.0%			-20.0%		
		7 - Efficiency	18	17	94.4%			10.0%		
		8 - User-friendliness	20	7	35.0%			-10.0%		
Human	Emotional	*9 - Attractiveness*	20	12	60.0%	65.5%	70.1%	-40.0%	-9.7%	-12.6%
		10 - Enjoyment	19	13	68.4%			-3.3%		
		11 - Fulfillness	16	11	68.8%			20.6%		
	Cognitive	*12 - Comprehensiveness*	14	9	64.3%	76.2%		-33.3%	-16.8%	
		13 - Meaningfulness	15	12	80.0%			10.7%		
		14 - Engagement	13	11	84.6%			-28.6%		
Social	Interpersonal	*15 - Communicativeness*	9	3	33.3%	61.8%	65.8%	0.0%	1.4%	18.2%
		16 - Collaborativeness	10	5	50.0%			-23.8%		
		17 - Confidence	15	13	86.7%			25.0%		
	Empathical	*18 - Attentiveness*	7	3	42.9%	69.2%		100.0%	32.4%	
		19 - Responsiveness	7	6	85.7%			-25.0%		
		20 - Helpfulness	8	4	50.0%			0.0%		
		21 - Respectfulness	17	14	82.4%			37.5%		
Intention to use		*22 - Convincingness*	20	18	90.0%	74.5%		-20.0%	-12.8%	
		23 - Willingness	16	10	62.5%			-9.5%		
		24 - Recommend	15	10	66.7%			-8.9%		
		Average Consistency	367	258	**70.3%**			-6.9%		

Seeing from the table, one could conclude that the average consistency of the answers for the two genders was 70.3%, whereas the difference between the genders for all answers was about 7%. From the differences across UX facets, it may be seen that women were less consistent in their answers for Economical, Emotional, Cognitive, and Intention to Use, with slight differences in Technological UX facet. However, women were much more consistent than men when evaluating UX properties related to Empathical UX facet, with the largest difference of about 32%, but a slight difference with more consistent answers in Interpersonal UX facet. As a result, men more consistent when evaluating UX properties of Business, Human UX dimensions, and their intention to use, whereas women were more consistent when evaluating the Social UX dimension.

A chi-square test of independence was performed to examine the relationship between gender and the consistency of the answers. The null hypothesis assumes that there's no association between gender and the consistency of the answers. The alternative hypothesis assumes that there is an association between the two variables. As a result of the test, there's no evidence to reject the null hypothesis. Hence the relation between these variables was not found significant, X^2 (1, N = 367) = 2.1059, p = .146733.

Additionally, at the end of the interview, four respondents were asked whether it was easier for them to understand the questions if there was the first quantitative survey and then a semi-structured interview, or vice versa. Two informants stated that it was better to have a quantitative survey and then semi-structured interviews because they believed it could have helped to reflect on the questions and to find mixed method data inconsistencies. Two others stated that it was better vice versa because it was easier for them to reflect on the questions while speaking. The sample is far from representative, but there are some reasons to believe that quantitative or qualitative data collection first may have affected the data, but for

some, it might have helped to understand questions better and thus give more valid answers.

Processing Error is a measure between Responses and Edited Data. The researcher is the main contributor to this kind of error, with a potential contribution at the stages of data transcription, quantitative, qualitative data analysis, as well as quantification of qualitative data and analysis of the quantified data. The researcher has listened through the audio recordings, carefully listening to the audios and carefully transcribing the interview. Furthermore, the researcher has verified several times that data is entered correctly in the results data table. At the stages of quantitative and qualitative analysis, the data were analyzed with the help of software to facilitate the reliability and validity of the resulting data. The researcher has done several iterations at all stages of data analysis in order to extract more meaning with greater reliability and validity. Qualitative analyzes of qualitative and quantified data are possibly most susceptible to the Processing Error, due to the high degree of reliance on the researcher's judgments and understanding, which is a methodological limitation. To address this issue, the researcher has described in great detail the methodology and process of research itself, providing where possible all of the data. A possible exception is interview transcriptions, given their too large text volume for being placed in a thesis. Thus, the researcher has taken all attempts at carefully analyzing the data and describing the logic of data analysis, so that the validity and reliability may be verified by other researchers as much as possible.

Summary of the Verification of the Results

To summarize the verification of the results, the TSE model adapted from Groves et al. (2004) was used as a template to systematically analyze the potential errors and biases contributing towards obscuring the data analysis results. At each of the stages in TSE, it is seen that there are potential errors that may have obscured the results. While some Errors (e.g., Coverage Error) are hard to estimate, other Errors (e.g., Non-Response Bias and Measurement Error in terms of consistency of answers) are more accurately estimated. In general, verification of the results may be summarized as satisfying, most of the potential errors and potential biases coming from the rather innate methodological limitations of a qualitative-driven mixed method study. Simultaneously, as in any scientific study, there are certain limitations, which must be acknowledged when interpreting the results of the study, which shall be described in the upcoming parts of the study.

4.4. Summary of Results

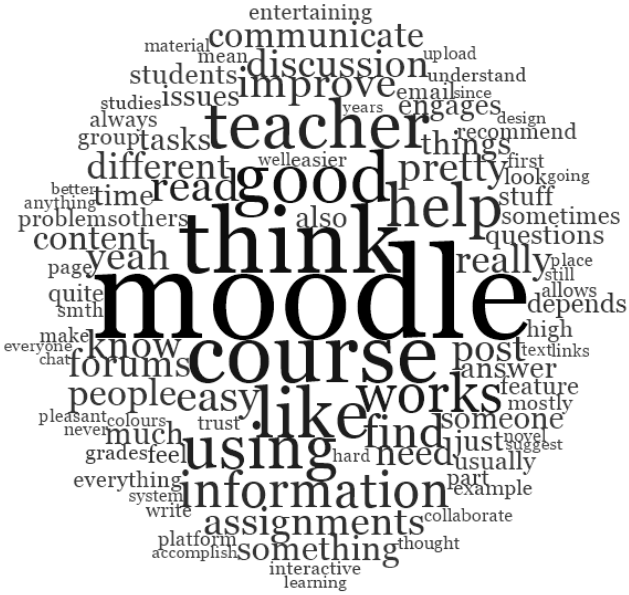
There are certain overwhelming results that arise as part of the data analysis. Results related to all of the three Research Questions (RQs) are drawn further. RQ1 analyzes the UX of Moodle in general, based on the quantitative, qualitative, and quantified data. RQ2 attempts to find whether there are gender differences in the UX of Moodle based on the quantitative, qualitative, and quantified data. RQ3 evaluates the application of holistic UX in the context of LMS in the case of Moodle.

RQ1: What is the UX of the students, who use Moodle of Åbo Akademi University?

According to the quantitative analysis, it may be said that there are certain attributes that are considered as good, whereas some are mentioned by the respondents as acceptable or somewhat unsatisfactory. UX properties that are considered as good or better: usefulness, pleasantness, productivity, reliability, efficiency, fulfilness, meaningfulness, engagement, confidence, respectfulness, intention to use. Some UX properties are between acceptable and somewhat good: user-friendliness, enjoyment, comprehensiveness, communicativeness, collaborativeness, attentiveness, responsiveness, helpfulness. Some UX properties are less than acceptable or somewhat bad: entertaining, novelty, attractiveness. The standard deviation for most of the UX properties and intention to use is between 0.75 and 1.8. Some UX properties are more variable (e.g., Novelty) than others (e.g., Productivity). Furthermore, hierarchical clustering analysis shows that there are four clusters of gradually diminishing UX for each consequent cluster. Students in cluster 1 have good UX. Students in cluster 2 have somewhat good UX. Students in cluster 3 have acceptable UX. Students in cluster 4 have somewhat bad UX. Most of the students are in the 2nd and 3rd clusters (16 students in total), whereas in 1st and 4th clusters are just 4 students. Thus, most of the students had UX, which is between acceptable and somewhat good. Students that have good or somewhat bad UX are rare.

Contemporary research is qualitative-driven. In terms of qualitative data, the analysis was comprehended on an extensive dataset of 20 semi-structured interviews across different UX properties. A word cloud (uses synonyms) represented below (Figure 21) may show an overall picture of the words that were used by the participants in the interview.

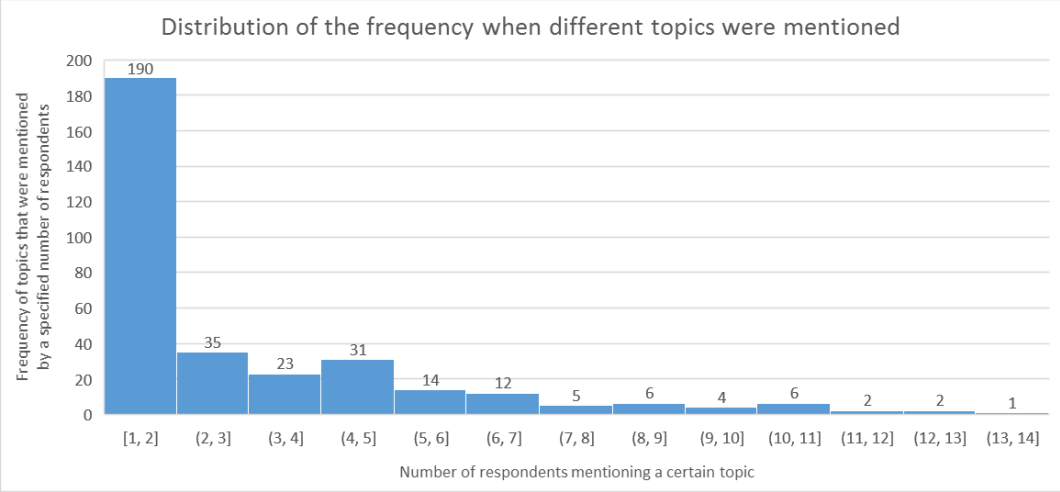
Figure 21. Word cloud (including synonymous words) based on the qualitative data analyzed in NVivo.



There were a lot of multiple topics mentioned by the respondents. Additionally, there were occasional improvement ideas that were mentioned by the respondents

in relation to different UX properties. In total, there were established 331 different topics that were mentioned by 20 respondents across the answers to the 24 questions. Topics such as "Total (unique)," "Evaluation" and grading scores "Good," "Bad," "Neutral" were removed, since these were considered to be summaries of the topics, and thus irrelevant to counting the number of topics. Most of these topics were having approximately 15 to 20 mentions, lying at the right end of the distribution. The different number topics that were mentioned in total by different respondents are calculated and shown in Figure 22 below.

Figure 22. Distribution of the frequency when topics were mentioned (y-axis) by a different number of respondents mentioning a certain topic (x-axis).



The distribution shows that most of the topics mentioned by single or a few respondents, as shown on the left side of the chart. With a greater frequency of the topic being mentioned by multiple respondents also decreased the number of such topics. In other words, there were many topics that were mentioned by a few respondents than there were topics that were commonly discussed. It is important to underline here that the frequency of topics mentioned was calculated across the UX properties, rather than as a whole (e.g., discussion forums mentioned by one respondent in one question and by another single respondent in another question are counted as two topics mentioned by a single respondent).

As a result, UX properties Pleasantness, Productivity, Reliability, User-friendliness, Fulfillness, Comprehensiveness, Communicativeness, Collaborativeness, Attentiveness, and Convincingness had most discussed topics. The most mentioned 15 topics that have 10 or more respondents (at least 50% of the respondents) mentioning them are outlined in the list below:

1 14 students mentioned that they were convinced that they would use Moodle, given that they are a student when speaking of convincingness.
2 13 students mentioned discussion forums when speaking of communicativeness.
3 13 students mentioned communication methods when speaking of comprehensiveness.

4 12 students mentioned the capability to increase or not grades when speaking of fulfilness.
5 12 students mentioned easiness or intuitiveness of Moodle when speaking of user-friendliness.
6 11 students mentioned e-mail notifications when speaking of attentiveness.
7 11 students mentioned other platforms when speaking of collaborativeness.
8 11 students mentioned communication with teachers when speaking of communicativeness.
9 11 students mentioned discussion forums when speaking of comprehensiveness.
10 students mentioned easiness to find information when speaking of productivity.
11 students mentioned how easy or hard it was to navigate or use Moodle when speaking of pleasantness.
12 10 students mentioned other people when speaking of comprehensiveness.
13 10 students mentioned that Moodle helped to increase grade when speaking of fulfilness.
14 10 students mentioned information retrieved on Moodle, for example, about the courses when speaking about user-friendliness.
15 10 students mentioned different minor technical issues when speaking of reliability.

Thus, as a result of the researcher's tacit understanding of the collected data achieved through extensive exposure to the data in the process of data analysis, and based on the most mentioned topics, it is possible to characterize the UX of Moodle in summary. It must be underlined that such a summary is just a model and may not show the whole UX, which is multi-factor and more complex than a text summary.

Moodle is considered to be an easy and intuitive study-related tool to use that facilitates the studying of the students, which provides usefulness, but not so much entertainment and enjoyment unless it is related to the studies. Moodle was also found to help increase the grades for many of the students to some extent, although not for all of the students. For several students, Moodle helped with the engagement in studying through several features, such as deadlines and a completion percentage of the course. Many features of Moodle were rarely used, such as wikis, whereas some more frequently used, such as discussion forums. Moodle was also found to be generally quite reliable, with only minor technical issues that almost did not cause any problems. Many students stated they had to use Moodle, although having no problem with that, some even underlining that they are very dependent on Moodle in their learning. Most students find Moodle to have an easy to use and navigate user interface (UI), although some do not. UI was also characterized as neutral, pastel, somewhat boring, and not attractive, although which did not concern students much. Mostly Moodle is used by the students in order to retrieve the contact details or the information about the course. However, many also outlined the usefulness of the feature to send tasks to the teacher. Some users stated that looking up information on Moodle was better than looking for the information in the libraries. There were a few students who have characterized their UX as very limited, using Moodle just to send the tasks or download documents and lecture slides. Although Moodle was not considered novel, for most, it was not a problem, some even

suggesting that novelty may have a negative correlation with the ease of use due to the lack of experience and skills of using Moodle.

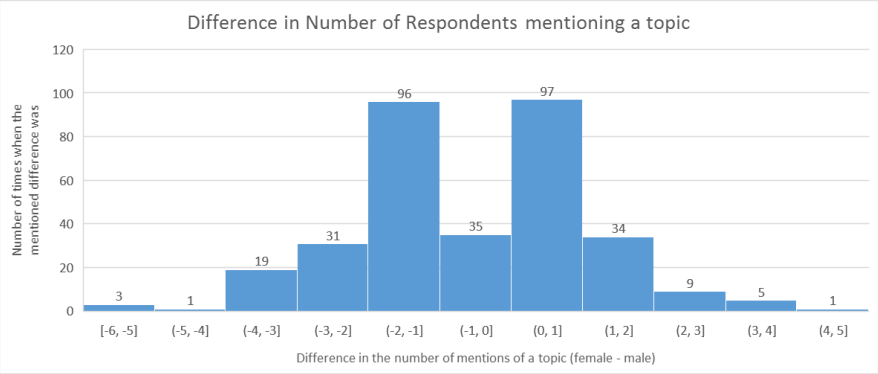
Moodle was frequently discussed in the perspective of using it together with other people in the social context or group dynamics. The UX of Moodle depends a great deal on how teachers structure the course in many of the UX aspects. Furthermore, many found the communication over Moodle to be formal and goal-oriented, yet dry and hypocritical. There are certain features that help with communicating over Moodle, although these are limited and may have to be improved. Discussion forums feature was the most widely mentioned feature, which was characterized by many of the students as old-school, although with some potential use if it were improved to be more modern with the chat function and group communication. Furthermore, the use of communicating features of Moodle differs if the communication is with teachers, or with other students. To compensate for the lack of communicating and collaborative functionalities of Moodle, many students refer to using other platforms: YouTube, e-mail, Google Drive, WhatsApp, Facebook. Additionally, other platforms, such as e-mail, YouTube, or links to external websites, are mentioned as affecting the UX of Moodle – for example, notifications sent to e-mails help students to be more attentive. Some find the UX to be improved by other platforms, whereas some find UX of Moodle to be negatively affected.

RQ2: Are there any gender differences among the students in the UX of Moodle?

According to the quantitative data analysis, mean scores across the two genders evaluating UX properties were to be at most up to 1.3. Furthermore, there were not found a statistically significant difference in medians across the two populations of students with two genders. Women were found to have statistically significant higher variability in evaluations of UX properties, based on the performed Mann-Whitney U test on the standard deviations of the UX properties across the two genders. Hierarchical cluster analysis showed that 3rd cluster was approximately even in terms of gender, whereas 2nd cluster was 70% male and 30% female. The best and the worst UX in 1st and 4th clusters were exclusively women (albeit, these were rare, and hence may be considered as outliers). Hierarchical clustering analysis shows that men are more likely to have somewhat good UX, while women were more variant UX since the best and the worst UX was had by women-only clusters. Finally, both women and men were found to have equally inconsistent qualitative and quantitative answers, according to the Chi-Square analysis.

Quantification of the qualitative data was employed to help find data that may answer RQ2. The difference in the number of respondents mentioning a topic was calculated for all of the UX properties. The difference is calculated by subtracting the number of topic mentions by males from the number of topic mentions by females. These differences were then extracted, and the frequencies of each were calculated, which were consequently plotted in the histogram, shown in Figure 23 below. As such, the left side of the histogram is devoted to the frequency of topics that were mentioned more frequently by males, whereas the right side of the histogram shows the number of topics, where females were more frequent. The center of the histogram at 0 shows the number of topics equally mentioned by both of the genders.

Figure 23. Distribution of the frequency of the topics that have a difference in the number of respondents of different gender mentioning topics.



As one may see, the distribution of topics that are mentioned by one male or female has a little bit over half (58%) – 193 mentions. Together with the number of topics that are mentioned solely by 0 respondents gives nearly three fourths (69%) – 228 topics. If we also include topics that were mentioned by 2 members more of one of the genders, we arrive at a number that almost 9 out of 10 topics were not different (89%) – 293 such topics. Thus, in general, respondents do not differ that much in terms of mentioning the topics. However, the resulting data also states that 296 (90%) of the topics had at least a minor difference in the number of mentions across genders.

Furthermore, there were a few topics that still were mentioned more by one gender than the other – 10 topics or roughly 3% of all of the topics. These topics were mentioned between 6 to 4 more of one gender than the other. The number of how many members from one gender mention more the topic than another corresponds to about 25% out of total respondents or almost 50% of one gender. In other words, these topics were mentioned by at least a half of respondents of one gender, whereas a few members of the other gender either rarely mentioned these topics or did not mention them at all. Table 39 below shows the topics that were more frequently mentioned by the two genders.

Table 39. Tabularized form of the topics that were mentioned most frequently by the two genders.

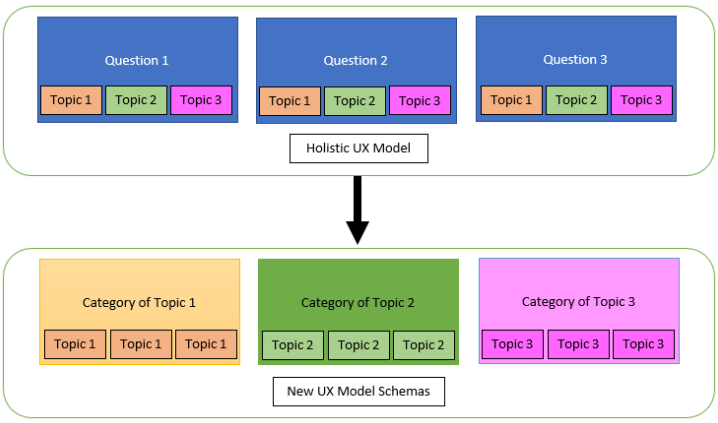
Topics more frequently mentioned by Females	**Topics more frequently mentioned by Males**
Colours in the attractiveness were mentioned by 6 females and 1 male. Four more females mentioned that fulfillness and engagement depend on the teacher, rather than on Moodle (5 females and 1 male for each topic).	Only 6 male respondents stated that Moodle allows to communicate, but these functionalities are not used. 5 more males stated that it was easy to find information than did females in terms of productivity (8 males and 3 females).

4 more females mentioned other people when answering comprehensiveness (7 females and 3 males). Finally, only 4 females and no males stated that Moodle is clear, simple, and minimalistic.	Other platforms were more frequently mentioned by 5 males when measuring collaborativeness (8 males and 3 females). Only four males stated that Moodle did not need to be attractive and no females.

RQ3: Is the holistic UX model by Topolewski et al. (2019) applicable for analyzing the UX of an LMS?

Holistic UX model by Topolewski et al. (2019) provided a good template of semi-structured questions to use in trying to evaluate a rather fuzzy concept of UX. The holistic UX model is allowing for a thorough inspection of many different aspects of UX. At the same time, even though a thorough analysis provided by the model may be helpful in some situations, but it is also quite time- and resource-consuming. Many of the questions were similar to each other. It was also found that the same or very similar topics were described by the respondents across different questions. Thus, it is suggested that it is necessary to analyze the UX based not on separate elements in separate questions but to combine these topics from separate questions and to analyze the topics by combining them in different groups. A visualization to facilitate understanding in Figure 24 below shows how different topics or themes mentioned by respondents when answering semi-structured questions from the questionnaire developed based on the holistic UX model by Topolewski et al. (2019) are rearranged into new UX model schemas where the mentioned topics are combined in the categories of common topicality.

Figure 24. Visualization of how the holistic UX model tends to analyze the UX of an LMS, and how new UX model schemas could be employed to facilitate the analysis of UX.

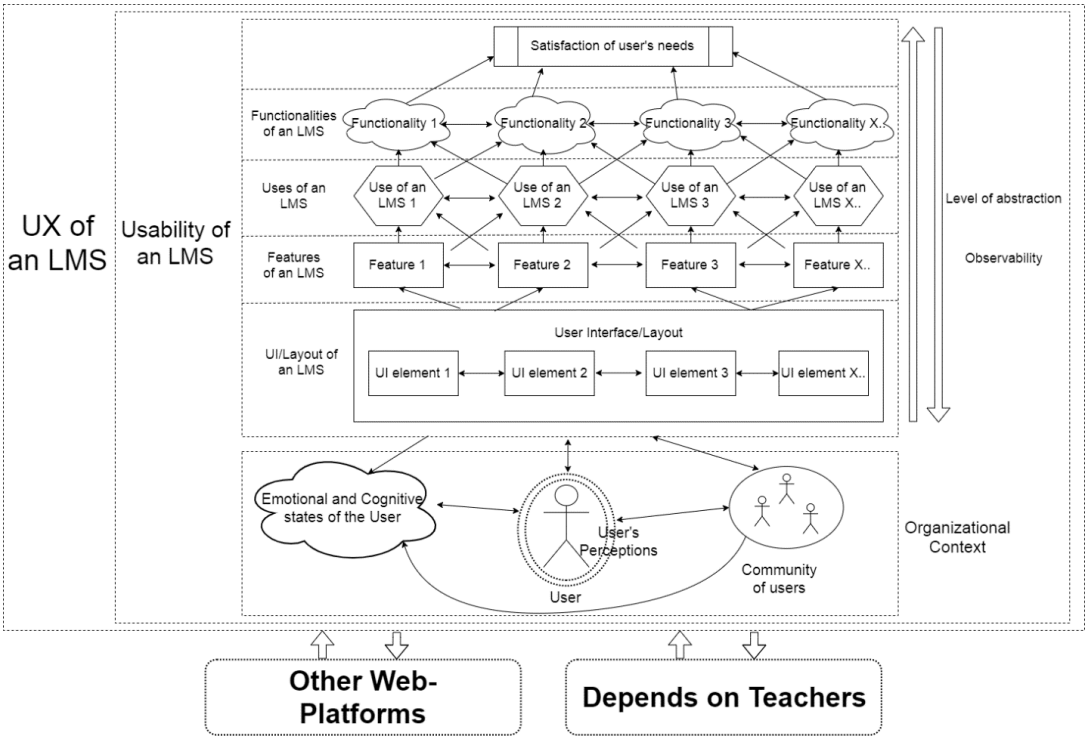


For example, multiple features were discussed across different questions, such as discussion forums or calendar. Instead of analyzing these features across the questions by pieces, it was found that it's easier to categorize all the information by categories of topics that are relevant to that specific feature, such as "Discussion

Forums" or "Calendar". It would improve the speed of analysis as well as accuracy, since in the process of this categorization some information might be lost, for example, because the researcher has missed some topics in some of the questions. Furthermore, since these features are discussed from multiple perspectives, the resulting categorization by topics would provide a thorough perspective similarly to the holistic UX model.

After the analysis of the answers to each of the 24 questions, the researcher has proceeded to analyzing the data by making attempts at classifying the topics mentioned by respondents into several categories. Categorization is inductive in nature, which, as it was stated in the methodology, could be combined with the deductive approach in the qualitative data analysis. As a result, based on the data, the researcher has managed to establish four categories that were discussed by the respondents. The first category is the types of uses of Moodle as an LMS. The second category is about the functionality as in on a broader, more abstract level than the types of uses of Moodle as an LMS. The third category is about the list of features in Moodle, which are used for different types of uses of an LMS. The fourth category deals with the layout or user interface (UI) of Moodle, which helps to connect the systematic features with the types of uses, as a result forming a functionality of Moodle. The categories are explained in more detail below. These categories are interrelated and could be visualized as a multi-level model (Figure 25).

Figure 25. A developed conceptual model of UX of an LMS.



The model shows how user represented at the very bottom interacts with the UI or layout of an LMS that consists out of several UI elements. Users may interact in the context of the community of other users (students or teachers), who may also interact with the UI. Both the user and the community of other users exist within an organizational context that may determine how these interact with the UI of an LMS.

UI (or layout) of an LMS then provides a link to features of an LMS that may be supported with the technical work of an LMS. Features of an LMS are providing for the different uses of an LMS. As a result, different types of uses of an LMS provide for a set of functionalities of an LMS. Hence, these functionalities determine the capability for the satisfaction of the user's needs. At every level, two-sided arrows represent the possibility of elements to interact in multiple combinations, hence providing a system that is greater than simply the work of the two features. For example, a certain combination of UI elements, such as color scheme, fonts, and text, may together form the feature of discussion forums. A combination of features of discussion forums and wiki could help with using Moodle for communicating and collaborating. The two uses of Moodle for communicating and collaborating combined together may provide for the functionality of socializing, which may be greater than simply just uses of collaborating or communicating separately.

Furthermore, the further the level is from the UI or layout, the greater the level of abstraction and thus the lower possibility for direct observability (by the respondent or the researcher). These categories form the usability of an LMS, which is concerned with how an LMS works as a system of these elements at different levels. It is important to underline that the difference between different levels of usability of an LMS is fuzzy, for example, sending tasks to the teacher may be part of a UI element, a feature, and the use of an LMS. The usability of an LMS and the community of users affect the cognitive and emotional state of the user. The emotional state of the user affects the user, thus influencing how an LMS is used. User's perceptions (e.g., beliefs or past experiences) may be forming a prism around the user, thus forming a subjective view that could affect how all other elements are perceived by the user. Thus, the usability of an LMS, how an LMS is used and perceived by the user, who is placed in the social context of a community of users and who is affected by the cognitive and emotional states in addition to the user's perceptions, are all elements that are forming a UX of an LMS. This definition is in line with the definitions provided by the literature. Furthermore, the UX of an LMS was found to be affected by the presence of other web-platforms (such as WhatsApp or e-mails). The influence is two-way, since how other platforms are used also affected by the UX of an LMS. How teachers plan and structure the work of an LMS affected the UX of an LMS.

UI/Layout of an LMS

User Interface (UI) or a layout of an LMS includes the visual representation of what a user sees and interacts with. This is the "face" of an LMS, and it is the main way of how the user receives results from an LMS. UI consists out of visual elements: fonts, images, videos, buttons, coloring scheme, hyperlinks, as well as design (i.e., how UI elements are arranged in the layout) and other representations of media and UI elements. These are the most "physical" representations of the usability provided by an LMS. UI may be considered a part of UX, but at the most basic level, and UI's role is to serve as a connector between user and features, which is a level above in terms of abstraction and observability for the user.

Features of an LMS

Features of an LMS are about doing something with the information and are more technical than the UI of an LMS. Features may be represented as UI elements, which are modified according to the work of the feature. However, features are not the same as UI elements. Features differ that they serve in a similar way to the mathematical function: features take a certain input from the user (a student or a teacher) in the form of information, operate with it in a certain way, and then give the output. The output may be and usually is represented as a change in the UI elements. For example, a user (student) posts some information on discussion forums, which is a feature, through typing into a UI element represented by a text box. The feature takes that information, stores it on the server, as a result changing another UI element on the discussion forums, which is a post of text. Another example could be when a user sends an assignment for evaluation to the teacher. User clicks on the UI elements (buttons) that allow uploading the document to the server, which is then (through modifying another UI element of an LMS) notifies the teacher and allows him or her to retrieve the document sent by the teacher through a modification of UI element. As a result, features are on a slightly more abstract level than the UI elements. Features may be applied for different purposes by different types of uses of an LMS.

Uses of an LMS

The use of an LMS can be characterized as an activity that relies on using features of an LMS through interaction with the UI of an LMS, as described above. The first use of an LMS is using Moodle to collaborate in studying, for example, through such features as a wiki or shared files to edit or through the use of discussion forums. Communicating with others is second use, which involves using Moodle for communicating with teachers or students in general. Thirdly, Moodle could be used to improve studying, which may be represented in the improved grades and higher engagement to study. Fourth is about using Moodle for planning studies through the use of calendar, deadlines, or the content overview of the course. Fifth use is about retrieving practical information – contact details of teachers or students, deadlines of the assignments, and information about the course. Sixth use is about retrieving information related to studying itself, such as downloading files from Moodle that contain study content. Final use is about uploading the information, mostly represented in sending tasks and assignments for the teacher's evaluation. Different types of uses are generic categories with unclear boundaries and are obviously interrelated with each other (such as communicating and collaborating for studying or retrieving content information and practical information). As a result of different uses, these form functionalities of an LMS.

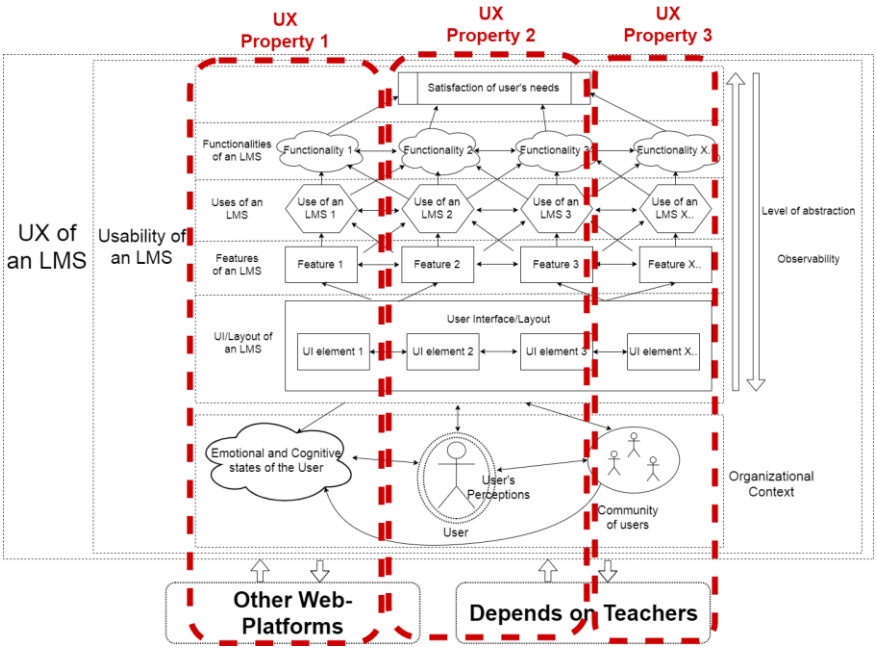
Functionalities of an LMS

Functionality is about the user's needs and the ability of an LMS to satisfy these needs. Semi-structured questions developed based on a holistic UX model seem to be aiming at asking questions to explore UX at that level. In other words, functionalities of an LMS are almost identical to the UX properties from the holistic

UX model. The distinction is that these functionalities of an LMS are referred solely to the system of an LMS in the pure, "concentrated" form. Participants, on the other hand, when asked about the UX properties tended to mention a multitude of other things, which are related to the functionalities of an LMS, but are not the functionalities of an LMS per se. For example, when asked about the UX property communicativeness, respondents tended to evaluate the functionality of an LMS "communicativeness" – how Moodle satisfies the need of users for socializing. However, users also tend to mention discussion forums in addition to using other platforms, thus touching on multiple elements at different levels from the conceptual model of a UX of an LMS.

In other words, similar to melting ore in order to separate slags from the metal, the functionality of an LMS is an essence of an LMS to satisfy certain needs of users. The functionality of an LMS is understood as the property of an LMS, which does not go beyond the LMS itself. This is different from UX properties that seem to be concerned with evaluating not just the functionality of an LMS, but also other related things, from the perspective of the system. UX property of an LMS and functionality of an LMS thus are highly related concepts, but with very slight differences in what they represent. Furthermore, the topic is complicated with the nature of UX that is fuzzy and has multiple highly interrelated concepts. This is an attempt at trying to distinguish elements of a UX at a more granular level. The difference in understanding between UX property and functionality of an LMS may be seen in Figure 26 below, which is based on the developed inductively conceptual model. This continues the idea that, as a result of methodology employing semi-structured questions developed based on a holistic UX model, users tend to mention the same topics from different perspectives across different questions. In this case, users tend to mention the functionality of an LMS in addition to other elements at different levels of a UX of an LMS in the same question.

Figure 26. Visualization of what the UX properties measure in the developed conceptual model of UX of an LMS.



Depends on teachers (i.e., LMS Content Managers)

As frequently mentioned, students state that from their opinions, the use of an LMS in many ways depending on how teachers use an LMS and how they structure the content. Thus, it may be best to characterize such role of the teachers as content managers of an LMS. The role of the content manager of an LMS was considered to be highly crucial by many of the respondents in many of the responses. LMS itself was then considered to be a "blank tool" that could be used properly or improperly. Hence, the impact of teachers as content managers is sometimes detrimental to the UX of an LMS. It is important to mention that teachers are both content managers of an LMS, and users of an LMS (albeit, from a different than student's perspective). Teachers that use an LMS may also be represented as being a part of a community of users, as it was frequently mentioned by the students who interacted with teachers over an LMS. Content managers of an LMS may have different tasks at hand, which are devoted to planning, creating, organizing, structuring, and managing the content of an LMS.

Other Web-Platforms

Additionally, often UX of an LMS was perceived in the context of other web-platforms. These web-platforms were used with different intentions in mind. Thus, other web-platforms had different roles. Some web-platforms were used instead of some features of an LMS, such as WhatsApp or e-mails instead of discussion forums ("replacing role"). Some were used complimentarily with some of the features of an LMS, for example, links to the lectures hosted on YouTube ("complementary role"). Others were compensating for some of the lacking features of Moodle, such as Slack or Google Drive, in co-editing school assignments ("compensatory role"). In all of these cases, the use of the LMS and other web-platforms changed; thus, it could be said that UX of both LMS and other web-platforms have affected each other.

5 Discussion and Conclusions

Discussions and Conclusions is the final part of contemporary research. In this part, answers to the research questions from data analysis results are discussed. Practical implications are drawn as a result of the answers to the research questions. Consequently, the results are also assessed in relation to existing research. Limitations of the research are drawn and discussed. Finally, recommendations for future research are given.

5.1. Answers to the research questions

RQ1: What is the UX of the students, who use Moodle LMS of Åbo Akademi University?

Moodle is considered to be useful and easy to use study-related tool, which provides multiple features, although not all of which are used. Many students stated that their learning in the university is very dependent on Moodle, particularly in the programmes where courses are predominantly online. However, the use of Moodle was limited for some students, who claimed that they preferred traditional learning to e-learning over Moodle. Generally, Moodle is not viewed as an entertaining or enjoyful platform and should be considered different from a platform like YouTube. UX of Moodle is variable for different students. Additionally, social context and use by others are essential factors in the UX of Moodle. However, communication features were weakly satisfying. UI of Moodle was described as clear and good enough for the studying tool, but not very attractive. Other platforms were responsible for impacting UX of Moodle: YouTube, e-mail, Google Drive, WhatsApp, Facebook. These platforms were either replacing, complimenting, or compensating certain UX elements of an LMS. Additionally, how teachers used Moodle was considered to be among the most influential factors in the UX of students. There were multiple improvement ideas of UX suggested by the students, often in the context of what they did not like about Moodle. It may be possible to discuss how to improve the UX of Moodle based on the collected feedback from the users. The areas for improvement concern features of Moodle, UI of Moodle, communication over Moodle, and the use of Moodle by the teachers. The latter two were considered to be more critical issues than the former two.

To begin with, multiple students were not aware of the existence of many features, sometimes even not aware of the features, which were proposed to be implemented in Moodle, like group chat function. Students could be informed by training programmes or by popup windows in the UI, as proposed by one student. Multiple students suggested improving the content presented on Moodle by making it more interactive, engaging, and visually appealing. Some students outlined issues with navigation, mainly in the area of enrolling in and navigating between courses. Additionally, students suggested improving the visual appeal of UI of Moodle by making UI more colourful, while maintaining the already-present clearness and simplicity. However, UI was not found to be an important priority, and thus it is suggested to spend resources to focus on improving other issues first. It is advised to keep in mind that other web-platforms were found to have an impact on the UX of Moodle and to try integrating the three different roles of these web-platforms in the overall use of Moodle. Designers of Moodle are best advised to keep an eye on

the web-platforms, which are replacing or compensating something in the use of Moodle since these show that something is lacking in the UX of Moodle (e.g., instant messaging).

It is strongly advised that universities consider issues over how to manage LMS in terms of published content, given that content is a significant impact in the UX of LMS, and as such, a significant impact in students' e-learning, which is a part of students' learning in the university in general. Many students found that Moodle is just a "blank slate" tool in many of the UX properties, with UX depending on how that tool is used. Since teachers have a great impact on the UX of LMS, it is suggested that teachers are informed on that. Additionally, many students stated that some teachers create course content that is more interesting than other teachers. Thus, it is highly proposed that special initiatives are taken to improve teachers' abilities to use LMS and to structure the content in an engaging way. Furthermore, it is advised to inform the teachers on their role as facilitators of the discussion over LMS, with many students stating that teachers have the power to increase students' engagement in the discussion over Moodle. An example of such an initiative could be to organize training programmes for the teachers, where they are taught how to structure the course content in a more engaging way. Another example could be to suggest the administration of the university to promote communities of practice of the teachers around using Moodle. Finally, it may be suggested that the university has personnel dedicated to maintaining and improving the quality of content over Moodle through helping teachers structuring the content of their courses.

Many students suggested improving communication on Moodle by modernizing discussion forum mechanisms, implementing private messages, chat function, group communication. Interestingly, many students stated that in principle, there are possibilities for proper communication over Moodle, but which are not widely used. Teachers were found to have a great impact on the engagement in communication over Moodle. Thus, it is suggested that teachers engage students in interesting, engaging discussions. For example, teachers should provide alternatives to "state a fact" type of discussion in assignments, which were described as boring and shallow. Some students stated that they liked using discussion forums if the discussion is personally relevant, for example, in their careers. Hence, as an example, it may be advised that teachers facilitate a discussion over LMS that facilitates students' career perspectives. However, each situation is unique, and thus teachers are advised to look into methods to create more personally engaging discussions.

Also, advertised UX and actual UX may differ significantly. Moodle (2019), on its official website, characterizes its interface as *"modern and easy to use, easy to navigate on both desktop and mobile devices."* Even though many users commented that it is user-friendly for the most part, there were some issues outlined. Adding new courses and sometimes navigating in the content between different courses was challenging for some users. Furthermore, the mobile version was not very comfortable to work with for many users in addition to complaints of the users regarding the mobile app of Moodle. As such, the UX that was proposed by the Moodle on its official website and the reported UX by the users differ. The extent to

which the UX is different is not clear, as well as the potential causes for the difference.

RQ2: Are there any gender differences among the students in the UX of Moodle LMS?

Contemporary research stops short of making strong claims regarding RQ2, but the research could give some suggestions, due to the qualitative, rather than quantitative research approach. The evidence provided in the research shows that there are no major differences in the UX of Moodle LMS across the two genders. For the most part, the UX is similar across the two genders, with insignificant differences across the two genders, but there are certain suggestions in the results; how a UX that could be different. Quantitatively on average, UX does not differ between the genders. Both genders were found to give equally inconsistent answers at about 70% consistency rate. However, men were less variant in the UX than women – men were more likely to have somewhat good UX, but women were likely to have a wider specter of UX. Based on the quantified qualitative data of the number of respondents mentioning certain topics, for the most part, UX does not differ across the two genders.

There are 10 topics (or 3% of total) that are more mentioned by one gender than by another. According to the most mentioned topics by the two genders, it may be concluded that females may be more oriented towards the holistic, somewhat harmonic use of Moodle (how it is used by others, by the teacher, how attractive it is), whereas males tended to view Moodle in more practical, functional, goal-oriented terms (not focusing on attractiveness, evaluating functionalities of Moodle for their ability to provide effective communication to perform tasks, such as learning). Curiously, 90% of topics had a difference of only up to 2 members between the genders. However, 90% of the topics were mentioned by at least one more respondent of one gender than another.

A sort of shade or tone that may potentially exist in the UX between the genders (one gender being slightly more focused on certain topics than the other). The result is that UX of an LMS shall be considered more or less similar without any significant differences between the genders. However, there are some minor differences in general, which may be even more pronounced in a limited number of areas. Referring to a metaphor, UX of an LMS was not found to be as a simple dinner table, with one common flat surface. Rather, the UX is more like an office table, which has one large flat working surface, but with some additional surfaces above the table (e.g., for the computer screen) and below the table (e.g., the drawer). The large flat surface represents the common part of UX to both genders, whereas additional surfaces of the office table shall represent nuances in the UX of an LMS for the two genders. The large working flat surface is the main part of the office table, which is used for working with the documents, or with the computer. The surface above the table may be used for placing a monitor but not suited for storing documents. Drawer's surface could be used for storing documents but could not really be used for holding a PC monitor. Similarly, the UX of an LMS is similar for the two genders for the good chunk of it. However, there are possibly certain parts of a UX that may differ across the two genders.

RQ3: Is the holistic UX model by Topolewski et al. (2019) applicable for analyzing the UX of an LMS?

The researcher has found that the questionnaire used in the research by Topolewski et al. (2019) based on the holistic UX model of Pallot et al. (2014) may not be very accurate, but it may serve as a stepping-stone for the research of a UX of an LMS. Semi-structured questions in the mixed methodology of contemporary research were helpful at evaluating multiple aspects of a UX of an LMS at different levels. As such, the questionnaire used in contemporary research may be considered as a tool that allows conceptualizing the space of the UX of an LMS broadly at different levels. Additionally, if semi-structured questions are supplemented with additional questions, *"What would you like to improve in this UX property?"*, then it is possible to form an understanding of how students would have liked to improve their UX of an LMS.

However, the diversity of topics mentioned by the respondents in semi-structured interviews was found to be better categorized through other categories than those in the holistic UX model. As a result, the researcher has proposed a model that consists of different elements. The elements or categories are UI/Layout, features, uses, and functionalities of an LMS that help to satisfy the users' needs. These categories make up the usability of an LMS, which is an integral part of UX. Furthermore, questions asking to evaluate UX properties also touched on other platforms, users' emotional and cognitive spaces, the community surrounding the user, organizational context, and teachers as content managers of an LMS.

Additionally, it must be mentioned that there are certain questions in the holistic UX model that focus on the topics, which are not mentioned in other questions. For example, the novelty of Moodle is found to be discussed only in one question that asks to rate the novelty. This is contrary to the discussion forums, which were mentioned when discussing user-friendliness, comprehensiveness, collaborativeness, communicativeness. Certain questions were more functional than others. For example, the types of uses of Moodle could be noticed in the questions regarding the usefulness, whereas more abstract feeling aspects were represented in other questions, such as in the question regarding pleasantness of use. This may speak of some questions being more generic that may have more potential topics discussed than other questions. It may also characterize the holistic UX model as having more questions aimed at evaluating certain aspects than towards others.

As a result, the researcher concludes that UX of an LMS may be evaluated in greater detail with the use of the devised conceptual model since it allows to distinguish between the different elements of a UX of an LMS better than the holistic UX model. The resulting conceptual model of a UX of an LMS may be used to help orient oneself when discussing the fuzzy UX of an LMS, as well as potential differences between users of different properties, such as gender. Additionally, respondents are evaluating quantitatively the UX properties rather than individual elements; hence even if the researcher through a significant time expenditure is able to analyze different categories by qualitative coding, it is impossible to compare these qualitative insights with the quantitative evaluations of the individual elements.

While it is possible to target specific elements of an LMS (i.e., more like a "sniper" approach), semi-structured questions of a holistic UX model target much broader areas (i.e., more like a "shotgun" approach). Thus, the holistic UX model may be good at analyzing broad areas of a UX but may not be particularly good at targeting specific elements of a UX, for which the proposed model may be better suited.

Furthermore, mixed methods research was found to provide richer data and potential for drawing conclusions than the qualitative research only. Richer data comes from being able to analyze the consistency of the quantitative and qualitative answers, as well as being able to verify the researcher's understanding of the respondents' interviews through comparing the codes with the quantitative evaluations. At the same time, the cost of collecting additional quantitative data is very low in terms of asking respondents to spend about five additional minutes for filling in the quantitative survey in addition to the semi-structured interview. However, there is a potential for a drawback in the contemporary mixed methods of having to expend higher resources, such as time devoted to data analysis on a larger dataset (such as sample size of 100 or over), if compared with purely quantitative methodology. Depending on the research question, the collection of qualitative data may be unnecessary for quantitative studies, where the purpose is, for example, to compare the difference between the two populations across pre-defined parameters. As such, mixed methods are proposed as preferable to the purely qualitative methodology based on semi-structured interviewing when evaluating a holistic UX of an LMS. However, the researcher stops short of proposing the mixed methodology for analyzing UX of other IS than LMS, let alone other products. Furthermore, some purely qualitative methods, such as based on unstructured interviewing may provide data that could not be covered by the proposed mixed methodology.

5.2. Practical Implications

As Sanders (2002) states, the researcher in the User-Centered Design collects primary data or uses secondary data to learn about the needs of the user, with the consequent interpretation of the information, which is then proceeded to the designer of the product. Due to the pragmatism research stance, contemporary research may be treated as an interpretation report of the information about the needs of the user. Designers of Moodle LMS may rely on the report in the data analysis part to focus on any of the specific UX elements. Particularly, the focus must be on the UI, communication features, use of Moodle with other web-platforms, as well as learnability of Moodle by students. Teachers and administration of universities, in general, may be advised to take an active, somewhat more centralized approach to manage the UX of LMS, given that this may have a detrimental impact on the e-learning of students. Furthermore, when designing LMS or providing e-learning through it, gender shall be considered to be of minor importance, although some areas (like visual appeal) may still be potentially important for students of a different gender.

Answers to the third RQ are more directly applicable to provide advice in the category of "how to do" rather than "what to do", like in the first part of the practical implications. Potentially, managers of LMS may be interested in applying the new

conceptual model in the data analysis summary. As it was discussed, the developed model allows for a better understanding of the UX of an LMS in certain situations. Arguably, a developed conceptual model may be better suited for focusing on a specific aspect of a UX of an LMS. Another advice to the managers of an LMS may be to use the methodology developed in this research to analyze the UX as a whole, through the holistic UX model and the developed questionnaire. Hence, it could be advised to use the holistic UX model to inquire participants for analyzing UX of an LMS as a whole or try to utilize the developed conceptual model to focus on the specific parts of an LMS, if the holistic UX is already known. A word of warning must be given that the developed conceptual model of a UX of an LMS is not yet tested, and there's yet no developed questionnaire or methodology. Yet, one could utilize the model for an understanding through visualized information on how different elements of a UX of LMS are related to each other. It is potentially necessary that the model is adapted to LMS and organization. However, it is unlikely that in the university context, elements of the LMS would differ significantly from the Moodle LMS in the Åbo Akademi University.

5.3. Assessment of the results in relation to existing research

The findings of the contemporary study allow comparing the results with previous studies. UX of an LMS may differ significantly across the different research. The real-time chat function is mentioned to be available in Moodle, enabling participants to have a real-time synchronous discussion in a Moodle course (Cavus & Zabadi, 2014). Multiple students in contemporary research have found the chat function in Moodle to be absent or lacking development for satisfying use. Findings may be contradicting previous research due to the potential variability in the versions of Moodle across time and across universities. As such, it is proposed that the findings of this research are highly contextualized to the use at Åbo Akademi University and may not be directly extrapolated to other contexts and uses of Moodle systems in other universities. In other words, UX depends on how universities design and maintain Moodle. If Moodle is designed by good professionals, then the UX is good. If Moodle is designed by amateurs and maintained improperly (e.g., hosted on bad servers), then UX would suffer. Furthermore, Lamichhane et al. (2019) state that if users are evaluating different LMSs, then because of having something to compare with, evaluations may change. Contemporary study confirms this, given that some users evaluated Moodle's UX in relation to the LMSs that were used before. Nakamura et al. (2017a) state that according to the performed systematic literature review, none of the research in usability and UX of LMSs proposed solutions to the identified issues in usability and UX of studied LMS. Contemporary research has addressed this gap by proposing potential solutions to the identified issues in the UX of studied LMS. It was possible to do so due to the pragmatic research stance and user-centered design research approach, which also allowed to acquire ideas for improving UX from the users of LMS.

Literature regarding gender differences in the UX of an LMS differs across the existing literature, as it was previously mentioned. To remind, González-Gómez et al. (2012) state that there are few differences between male and female students in their use of e-learning and their motivation and satisfaction. Aufderhaar et al. (2019, p. 66) claim that gender difference has no significant impact on the typical UX factors

of different website designs. Simon (2000, p. 18) concludes that the perception and satisfaction of the website may differ within cultural clusters and gender groups. The contemporary study has found little evidence to confirm significant gender differences in the UX of Moodle on average. Nevertheless, there were differences in the variability of evaluating UX of Moodle. Men were more likely to have between somewhat good and acceptable UX, whereas women were having between good and somewhat bad UX. Furthermore, there might be a slight difference in the focus when evaluating UX. Females may be more attentive to the communication nuances with others when using Moodle. More males mentioned the functionality of Moodle to serve as a tool to provide information. However, this shall be considered as a suggestion for the existence of such gender difference (due to the limitations of the qualitative methodology) and shall be explored further in other research. Additionally, both men and women were likely to give inconsistent (qualitative to quantitative) answers when evaluating UX.

Potentially the main assessment comes as a result of evaluating how well the assembled methodology based on the literature review is able to explore, analyze, and explain UX of an LMS. As it was stated in the answers to the RQs, the contemporary study utilized verified quantitatively holistic UX model by Topolewski et al. (2019), based on the holistic UX model by Pallot et al. (2014). The difference comes in the study context – while Topolewski et al. (2019) verified UX of a feedback-collecting app Jaxber, which is a different Information System than the LMS Moodle. The contemporary study has found that the model was useful in exploring the UX of an LMS when utilizing a qualitative-driven mixed methods approach. However, the holistic UX model by Topolewski et al. (2019) analyzed UX somewhat too much broadly. Thus, a new conceptual model of a UX of an LMS is proposed in the contemporary study, which may increase the accuracy of evaluations by allowing to focus more narrowly on certain elements of a UX of an LMS. Furthermore, proposed answer inconsistency typology in mixed methods by Krawczyk et al. (2019), which attempts at filtering out in a mixed methods study of UX of an IS by removing answers that have qualitative to quantitative inconsistency, was somewhat confirmed in terms of its under- or over-valued answers. At least in that regard, the typology was proven useful at the stage of verification of the results, which has helped to somehow establish the reliability and validity of the data.

5.4. Limitations of the research

As shown in the verification of the results, which is based on the Total Survey Error (TSE), there are multiple potential sources of error, which shall be discussed in the limitations of the contemporary research. Limitations of the research could be classified in several general areas, which are interrelated. Researcher, who is also in the role of interviewer, methodology devised by the researcher, and data analysis' ability to generate reliable and valid results are one of the potential sources of bias. The context of the research is another potential source of bias. The sample size and interviewers are other sources of bias.

Researcher/Methodology/Data Analysis

The first potential source of bias comes from the researcher (who is simultaneously an interviewer and data analyst), methodology, or data analysis. Setia (2016) states that in a cross-sectional study, it may be potentially difficult to establish reliable and valid causal relationships. The study has the typical limitations of qualitative interview studies (Yin, 2003). Although the researcher has done his best to collect, document, and analyze the data as carefully as possible, it is possible that not all meaningful findings were found. Hennig (2007) states that cluster analysis is done in an exploratory manner, and the patterns found by cluster analysis are not necessarily meaningful. A qualitative survey is the study of the diversity of member characteristics within a population, in contrast to the statistical survey, which analyzes frequencies in member characteristics (Jansen, 2010). Quantitative surveying of the respondents may be better suited for looking for differences in the frequency in populations (e.g., based on gender, age, study major, and so on). The qualitative analysis could provide the basis for a variety of frequencies. In other words, the qualitative analysis could help for answering the question, "where shall the science look for the answer?" Contemporary research may provide some suggestions where the gender difference in the UX of an LMS may be found, but the research's methodology could not confirm the extent of the presence of the gender difference.

The established qualitative difference in terms of how many respondents mentioned topics, and what is the gender differences may come from the potential obscuration from the methodological limitations. Respondents may have been biased by the researcher's influence to answer in a certain manner. Informants may also forget to bring up the topic, hence tweaking the total numbers of how many respondents mentioned a certain topic. The researcher may not have noticed and thus not encoded some of the topics in the NVivo. Finally, the topics may have been mentioned across different questions and if summed up together – leading to different total numbers of mentions by respondents.

It is important to outline the potential for the researcher's bias in coding for answers, and as such – in verifying the consistency between quantitative and qualitative answers of respondents. As an example, one respondent has stated that under certain conditions, she feels engaged. She said, *"If there's an assignment that you have to hand in, then yes,"* or answering if the teacher engages her, she responded, *"Yes. By providing material. Again, I do not know."* As such, the respondent was coded that she evaluated felt "Engaged." However, later at the stage of verification of the results, quantitative marking was at score 2 ("Bad") when evaluating the engagement of Moodle. Arguably, the respondent might have been coded as "Neutral" in terms of engagement if another coder was at work, and thus the inconsistency might have been judged to be lower. Hence, verification of the results must be viewed, considering that there are certain limitations that are inherent in the qualitative methodology of the subjective bias of the researcher as a coder.

The mere presence of the researcher could contribute to the bias of the respondents behaving in a certain way, referred to as the "researcher bias" (Miyazaki and Taylor,

2008, p. 779-780). In addition to asking semi-structured questions, the researcher has sometimes explained questions, gave metaphors, and asked additional questions. Thus, the researcher may have impacted the degree to which certain topics were mentioned more often than others. Some informants were asked at the end whether it is easier for participants to understand and to answer the questions when the quantitative survey is first with consequent semi-structured interviews or vice versa. Respondents' answers indicate that the order of data type collection (quantitative or qualitative first) could have impacted the data in some way, such as making it easier for some to understand and to answer the questions, thus answering differently.

The holistic UX model, which forms the theoretical framework, is not widely used in the context of evaluating UX of LMS. Thus, the theoretical framework may lack validity and reliability. The proposed model of a UX of an LMS is entirely based on the researcher's understanding of interrelations of the elements that results from data analysis and the review of the literature, and thus may require further verification of the model, for example through the use of structural equation modeling.

Context

Secondly, the research context should be considered as a potential source of bias for the collected data and the study's findings. Respondent surveying was comprehended in a public space in two out of several university campuses: ASA or Arken. Thus, some faculties might have been more present in the sample, which is potentially represented in the sample: there are more people from business or economics major (ASA campus) or liberal arts such as philosophy (Arken campus). The area where the interviewing was taking place had a different environment – sometimes noisy with many people passing by, sometimes silent with a few people nearby. Occasionally there were other people sitting nearby the participants, supposedly of their close social circle like study acquaintances, with a few times when these people commented on something but were asked not to intervene for the sake of not influencing the opinion of any given respondent, who was expected to give feedback on the individual UX. Oftentimes, however, respondents were alone when giving interviews. Respondents' responses might have been influenced depending on the context of interviews – by being distracted by the surrounding noise, having a greater than normal pressure when pauses in the interview took place from the surrounding silence, or by having to conform to the social pressure in giving certain responses, among other potential bias. As a result, the data findings may not be directly extrapolated to other Moodle versions, LMSs, or universities.

Interviewers/Sample

Finally, there are multiple limitations of the research stemming from the sample or interviewers. Dixit et al. (2019, p. 31) state that principally, the problem of convenience samplings is that there may be problems regarding the generalisability of the results to the population. A small sample size (two sample groups of 10 respondents) might not be representative of a wider population of students at the Åbo Akademi University. At the same time, albeit having a small sample size, Hwang

and Salvendy (2010) state that for usability evaluation of software products there should be 8 to 12 respondents at the minimum, and thus the small sample size is deemed sufficient to give at least the descriptive statistics of the samples. However, Schmettow (2012) expressed certain doubts in the sufficiency of 8 to 12 respondents in usability studies, and hence these quantitative responses should be viewed in conjunction with qualitative analysis. The response rate was roughly 70%, which may contribute towards non-response bias.

Before being interviewed, respondents were frequently busy doing some other activity, with the most reported reason for not giving an interview by those who rejected being survey that they do not have the time or that they have to focus on studying. Thus, some respondents might not have been focused, giving not thought-through answers during the surveying, or giving shallower responses. As a matter of fact, one student said that she was in a hurry and did not think in-depth of the answer when asked to comment why she had given a low quantitative scoring for the questions relevant for the Intent to use, but mentioned that she is quite high on the intent to use Moodle verbally.

Some of the respondents knew the interviewer before being approached with a request to survey them or potentially saw the researcher on the public premises. Hence, some respondents might have been influenced by different social roles in the interactions with the interviewer, other than the role of an interviewee. Respondents who knew the researcher were noticed to give somehow more elaborate, more prolonged answers (such as one respondent, who gave almost an hour-long interview) than those respondents who did not know the researcher. Some respondents repeated their answers to different questions. It may be that the same answer might have suited similar semi-structured questions. It may also potentially show the lack of thought that some respondents gave when answering the questions. Social, cultural, age impacts that could also be affecting the UX of LMS. Thus, answers to the research regarding gender differences may not be valid.

Sanders (2002) has stated that there are certain levels of understanding of people's experiences, starting with explicit, how people say, going deeper into how people feel, and what they dream of. Contemporary research is primarily concerned with the explicit (surficial) and, to a certain extent, observable needs of the users of an LMS, according to Sanders' (2002) conceptualization. Thus, more profound experiences may have been stayed untouched as part of this research, and the findings may be based on incomplete data of the peoples' experiences. Interviewers themselves rarely expressed their emotions and feelings when giving answers. Mostly, informants have expressed how they use products, rather than how they feel during the use. As such, the analysis may be based on the data that lacks an important part of the UX.

Additionally, Hsee and Hastie (2006) state that memory introduces systematic bias into the evaluations, and as concluded by Norman (2009), many users could not remember all the details of their experiences when asked to evaluate these experiences after using the product. As such, the methodology of the contemporary study based frequently on the post-factum evaluation of the use of LMS may not be an accurate representation of the UX in the moment of the actual use of an LMS.

Additionally, some respondents might have used Moodle not long before giving an interview as compared to other students, which might have introduced additional bias to the results of this study of the variability of the UX.

The researcher found an inconsistency in the answers of the respondents between qualitative evaluations and the quantitative scores given in the surveys. Verification of the results contains an analysis of the extent to which the answers were inconsistent. About 70% of the answers are consistent. Hence, results may not be reliable or valid due to the inconsistency, which may come from interviewees' lack of understanding, willingness, or capability to give meaningful answers into their actual UX. There are some potential explanations for that. First is that the order of questions might have influenced the answers, which might also be an explanation for inconsistencies between the quantitative scores and the qualitative evaluation of the same UX attributes. For example, one respondent, when caught with such inconsistency and inquired for the reasons of why that was happening, recollected that after "thinking about questions," the opinion has changed. Another potential explanation is that respondents were not giving thoughtful comments (one student said that she was in a hurry and that might have affected her quantitative scores, which she has proposed to increase at the end of semi-structured interview).

5.5. Recommendations for future research

There are multiple recommendations and suggestions for future research. Recommendations may be approximately divided into methodology-related and concept-related. The former suggest improving the reliability and validity of the analysis of the existent issue by improving or using another methodology. Latter suggest exploring with an existent or another methodology concepts that are based on the findings of the contemporary study.

To begin with, future studies may improve the limitations of methodology. Convenience sampling may be replaced with probability samplings, the sample size may be increased, or there may be several coders of qualitative data to improve data reliability and validity. Additionally, it might be of value to include in the survey at the end whether it is easier for participants to understand and to answer the questions when the quantitative survey is first with consequent semi-structured interviews or vice versa. This may improve the understanding in the consequent research whether the order of data type collection (quantitative or qualitative first) could have impacted the data in a major way. Wordings of the questions could be improved to improve an understanding of the questions by the respondents. Future research may also attempt to verify that the questions used in this research are actually measuring the concepts – for example, by asking respondents to review whether the questionnaire actually evaluates the UX. Furthermore, the methodology from the contemporary study may be replicated in another context to verify the findings of this study.

The mixed method could be improved by taking a more proactive approach in trying to locate inconsistencies in the data between quantitative scores and qualitative scores, with the consequent inquiries of the informant to correct the response (either quantitative or qualitative) so that there is a higher consistency in the

answers. Finding inconsistencies could be at the stage of interviewing, or at the stage of data analysis when it is possible to analyze transcribed data in the context of quantitative scores. As a result, informants could be approached later to correct inconsistent data. Thus, data could potentially become more valid and reliable. The effect of bias (e.g., because of unthoughtful answers to the survey's question or because of better reflection) could be monitored and, at the very least, outlined more clearly.

Future research may want to utilize a different methodology to explore the same issue. Contemporary research relies on a qualitative-driven mixed methodology. Hence, for example, it may be advised that a quantitative-driven mixed methodology could be employed. The quantitative methodology may also be used to verify some of the findings, such as verifying, whether there are gender differences in the UX of an LMS. It is also possible to advise future research to explore based on the findings of this study. Additionally, emotions and feelings are considered being a major part of UX. However, interviewers rarely expressed their emotions when giving answers to how they use the LMS. Future research may try to take that into account. For example, by providing a survey that asks to name the emotions that were felt, or by asking respondents in the interview how they felt using LMS.

Continuing with concept-related recommendations for future research, developed in this study conceptual model of a UX of LMS, may be explored and verified. There are different elements that may potentially influence the UX of an LMS. Thus, the research may focus on specific elements (such as the impact of other web-platforms on the UX) or developed the model as a whole. The difficulty to outline a specific list of functionalities of an LMS is that the boundaries at that level of abstraction are highly unclear. For example, as part of the inductive analysis in NVivo, the researcher has established the functionality "socialization." The researcher has characterized this functionality as any sort of socializing activity that the users may indulge in when using an LMS – be it through simple communication on discussion forums with peer students or through the use of personal messaging to communicate with the teacher. In the holistic UX model, there may be different functionalities that aim at describing the same functionality – communicativeness, collaborativeness, respectfulness, among some potential others. As a result, it may be hard to define the functionalities, which are fuzzy and have unclear boundaries. Further work may be required to establish boundaries between different functionalities in the developed model.

Furthermore, the research was able to provide ideas where gender differences may exist in the UX of an LMS, but not to show the extent of these differences. As such, a study dedicated to analyzing the potential difference in the mechanisms of genders evaluating their UX may be proposed. In particular, quantitative methodology with random sampling is advised to be used. To devise the questions for the quantitative survey, findings from this question or the developed quantitative questionnaire on a 1-7 Likert scale may be used. In particular, a future study may focus on verifying the existence of a more variant UX among females than among males, as well as finding the reasons for it. Finally, future research is advised to analyze the impact of students' attributes other than gender, as a piece of evidence was found that different study majors may have an impact on the UX of an LMS.

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Appendices

Appendix 1. Questionnaire

Evaluation of Moodle's User Experience (UX) questionnaire

Survey #: _____
Date of a survey: _____

Please note that all information will be used in the research anonymously and it will be impossible to track the information back to you. If you feel uncomfortable asking any of the questions, you may skip the question.

Information about participant:

Name or Respondent number/ID:	
Age:	
Gender:	
Ethnicity or Nationality:	
Experience of using Moodle (i.e., for how long?), ***AND*** if used – of other LMSs:	
I mostly use Moodle in … language (e.g., in English):	
Exchange or home (Abo Akademi University) student:	
I am currently studying for a Bachelor's/Master's/other:	
Programme or study major (e.g., Engineering, Psychology or Business):	

Information about UX properties – Quantitative Survey:

In the following section of a survey, please answer to the survey questions using a 1 to 7 scale.

#	Question about UX property	Rate from 1 to 7 1 - very low 2 - low 3 - somewhat low 4 - acceptable 5 - somewhat high 6 - high 7 - very high						
1	Please rate the **USEFULNESS** of the Moodle (i.e., degree to which Moodle helps you to accomplish your tasks)	1	2	3	4	5	6	7
2	Please rate the level of **PLEASANTNESS** of using Moodle	1	2	3	4	5	6	7
3	Please rate how much **ENTERTAINING** is Moodle where the wording "unentertaining" would mean "boring"	1	2	3	4	5	6	7
4	Please rate the level of **PRODUCTIVITY** when using Moodle (i.e., to what degree Moodle allows you to be productive)	1	2	3	4	5	6	7
5	Please rate the level **NOVELTY** of Moodle (i.e., how novel is Moodle to you)	1	2	3	4	5	6	7
6	Please rate the level of **RELIABILITY** of Moodle which means whether you've been able to use Moodle without any problem	1	2	3	4	5	6	7
7	Please rate the level of **EFFICIENCY** of Moodle (i.e., how much Moodle allows you to be efficient in carrying out your tasks)	1	2	3	4	5	6	7
8	Please rate the level of **USER-FRIENDLINESS** of using the Moodle (how easy and intuitive is it to use Moodle?)	1	2	3	4	5	6	7
9	Please rate the level of visual **ATTRACTIVENESS** of Moodle	1	2	3	4	5	6	7
10	Please rate your level of **ENJOYMENT** when using Moodle	1	2	3	4	5	6	7
11	Please rate your level of **FULFILLNESS** (i.e., degree to which Moodle allows you to properly achieve a task)	1	2	3	4	5	6	7
12	Please rate the level of **COMPREHENSIVENESS** (i.e., degree to which Moodle helps you to understand others)	1	2	3	4	5	6	7
13	Please rate the level of **MEANINGFULNESS** (i.e., degree to which Moodle provides meaningful information to you)	1	2	3	4	5	6	7
14	Please rate your level of **ENGAGEMENT** (i.e., degree to which Moodle engages you in your tasks, such as learning)	1	2	3	4	5	6	7
15	Please rate your level of **COMMUNICATIVENESS** (i.e., degree to which Moodle allows you to communicate with others)	1	2	3	4	5	6	7
16	Please rate your level of **COLLABORATIVENESS** (i.e., degree to which Moodle allows you to collaborate with others in your tasks, such as learning)	1	2	3	4	5	6	7
17	Please rate your level of **CONFIDENCE** (i.e., degree to which Moodle allows you to trust others in your interactions with them)	1	2	3	4	5	6	7
18	Please rate your level of **ATTENTIVENESS** (i.e., degree to which Moodle allows you to be attentive to others)	1	2	3	4	5	6	7
19	Please rate the level of **RESPONSIVENESS** (i.e., degree to which Moodle allows others to be responsive to your posted information, or you to be responsive to others' posted information)	1	2	3	4	5	6	7
20	Please rate the level of **HELPFULNESS** (i.e., degree to which Moodle allows you or others to be helpful for each other)	1	2	3	4	5	6	7
21	Please rate your level of **RESPECTFULNESS** (i.e., degree to which others respond respectfully to each other)	1	2	3	4	5	6	7
22	Please rate your level of **CONVINCINGNESS** of using Moodle in the near future	1	2	3	4	5	6	7
23	Please rate your level of **WILLINGNESS** to re-use Moodle	1	2	3	4	5	6	7
24	Please rate how much you would **RECOMMEND** Moodle to be used in universities	1	2	3	4	5	6	7